NOVEMBER 19, 1938

ELECTRICAL WORLD

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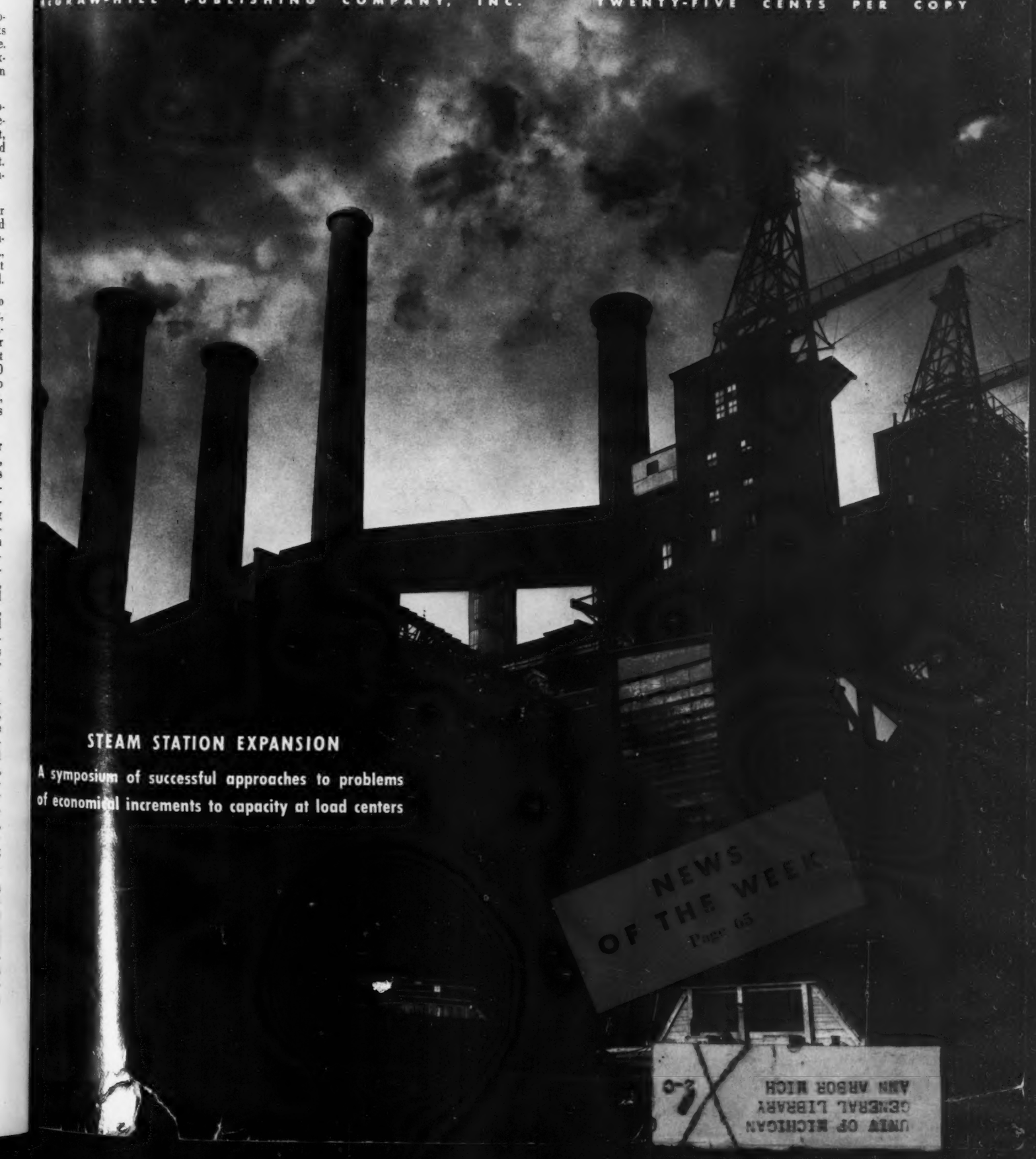

STEAM STATION EXPANSION

A symposium of successful approaches to problems of economical increments to capacity at load centers

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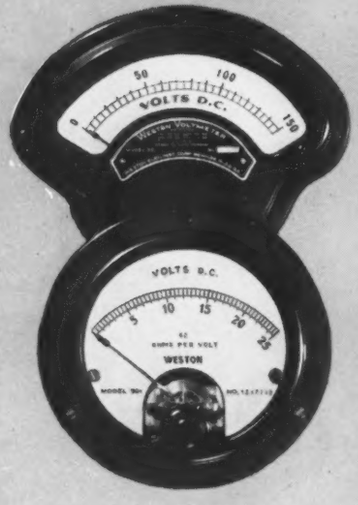

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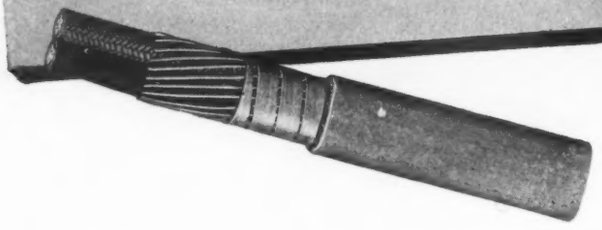
SERVICE ENTRANCE CABLE STYLE ABN

costs little, as it may be strapped to house without conduit. May be used with outdoor meter, or through foundation to entrance switch. Concentrically wound uninsulated neutral conductor and closely wound steel tape discourage current diversion.



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differs from Style ABN, in that the steel tape is replaced by a heavier double-wrapped tape cushion, and that the concentric conductor has more wires giving a closer coverage to make it diversion-proof.

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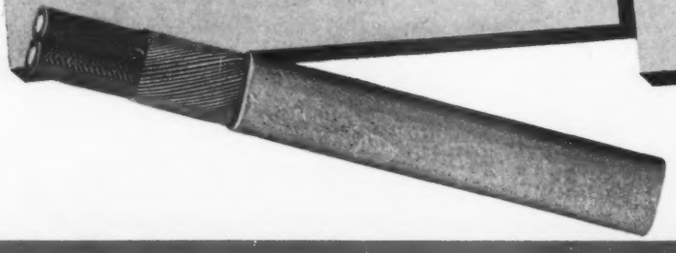
from pole to entrance cable on house. With single-hole entrance cap and rigid conduit, it is used from pole to meter. The closely wound concentric conductor makes it diversion-proof. Outer braid is finished with battleship grey paint.



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for service to or between buildings. Sizes No. 12 and larger. Armortite (1), and Hazasheath (2), are non-metallic armored, and withstand alternate wet and dry conditions, acid or alkaline moisture, and extremes of heat and cold.

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Letters TO THE EDITOR

Favors Controlled Direct Lighting for Switchboards

To the Editor of ELECTRICAL WORLD:

I have read with much interest "Advanced Methods of Control Room Lighting," in the October 8 issue of ELECTRICAL WORLD, and disagree most emphatically with the unfounded conclusion that totally indirect lighting is proper for control rooms. The history of control room lighting shows that twenty years ago the artificial skylight (Fig. 6 of the article in question) was considered the best because of the large area of light source. Next, the totally indirect system of lighting was used because it was in effect the same as an artificial skylight, but more efficient and cheaper to install. For the past five years the indirect system has given way to the more modern controlled direct light of the asymmetric "In-Bilt" type because the indirect type still produced annoying reflections from the glass meter faces and the excessively bright walls and ceilings were a source of glare, depressing the ability to see the meter scales.

This modern system of direct lighting controls the angle of incidence of the light so that the specular reflection from the glass meter faces is directed to the floor instead of into the eye, and only the diffuse reflection from the meter scale reaches the observer's eye. With the indirect system the observer must, in many positions, look through the image of the bright ceiling reflected from the glass meter face. With this in mind Mr. Morton's statement, "Any bright source of light, whether from direct lighting fixtures or from undiffused reflected light, will cause reflected glare or high light in the glass instrument plants" is not exactly correct. He should say, "Most bright sources, etc."

Polaroid definitely will not help the situation because the specular reflection from the glass instrument faces is not polarized except at a very definite angle of 35 deg. 25 minutes and the eye cannot always be in that position.

Mercury lamps offer no practical solution to the problem because alone the color is bad and in combination with Mazda its only virtue, efficiency, is lost. The new fluorescent lamp when used with proper light control equipment is effective, but its cost and large physical size limit its usefulness.

Art gallery lighting offers exactly the same problem as control room lighting. The artificial skylight and totally indirect lighting has been abandoned by art galleries for many years (Art Institute, Chicago; Philadelphia Art Museum; Wilmington Art Gallery, etc.) The technical consultants have worked out the exact color of background against which pictures are to be viewed for the best psychological effects and this color could well be applied to switchboards instead of white or buff, which were discarded by art galleries long ago.

It is refreshing to know that operating engineers are giving lighting so much well deserved attention, but I am sorry to learn that they have in some cases been ill advised. It has been my observation that before any sort of an investigation is undertaken the investigator become thoroughly familiar with what has already been accomplished in the field, lest he invent an oil lamp for an automobile.

DAVIS H. TUCK,
Electrical Engineer
New York, N. Y.

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Electric Singeing of Cloth

To the Editor of ELECTRICAL WORLD:

On page 880 of ELECTRICAL WORLD for September 11, 1937, there appears an article describing use of electric heat for singeing cotton cloth. Can you furnish any additional information regarding this use of electric heat? Was this equipment furnished by an American manufacturer, and if so will you please advise name of same. Do you know of any other successful installations for singeing cotton cloth?

W. H. BEARCE,
Industrial Engineer
Central Maine Power Company

[The installation of electric heaters for singeing cotton cloth described in the article referred to by Mr. Bearce is the only one which the editors have been able to uncover either in the United States or abroad. The units for the installation, described in detail in the article, were made in Japan. Sufficient data are given, however, to permit them to be made to order.—EDITORS]

Test Meter Not Used As Current Indicator

To the Editor of ELECTRICAL WORLD:

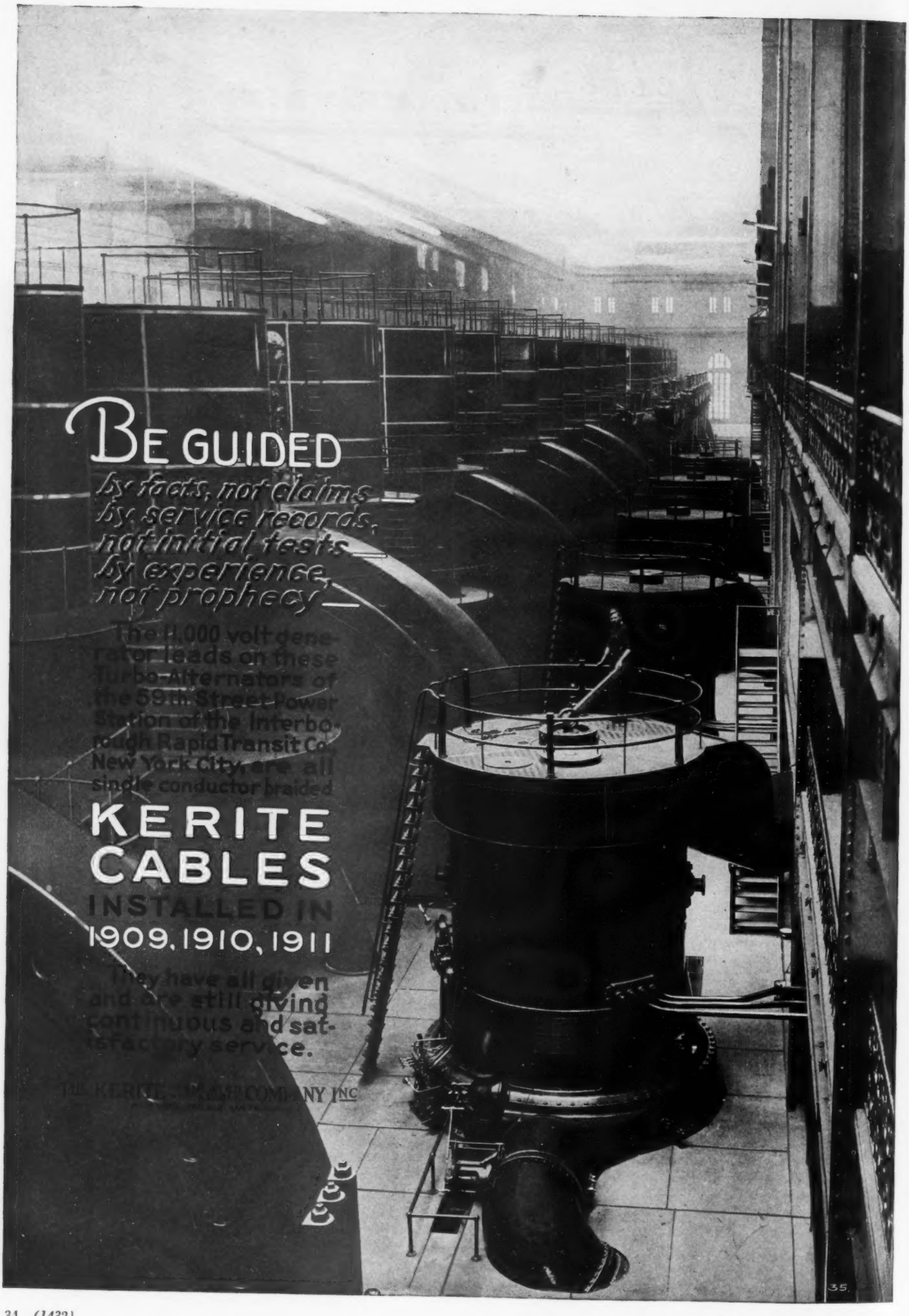
In Mr. Hush's letter which appeared in the August 13 issue of the ELECTRICAL WORLD I notice that he still seems to assume that I use the standard test meter as a current flow indicator. However, the sketch in my article ("In Service Check for Current Transformers," May 21, 1938, ELECTRICAL WORLD, page 39) shows the potential leads thereto short circuited, a condition under which it could not be used to indicate anything. I do use the watt-hour meter, which may be said to be its equivalent; however, in this test we are not interested in the true current value, but rather in the matter of whether or not—whatever its value—it varies synchronously with the variation of the test burden. If Mr. Hush wants to know the transformer loading, or phase balance, that is another matter, and that requires an ammeter in view of the fact that the load power factor is unknown.

Neither can I agree that as a "rough factor" a drop of 50 per cent in secondary current is acceptable in view of the high burden of 15 ohms and the possible low voltage of the primary circuit. I would prefer to use a normal burden equal to that of the transformer and accept no appreciable drop in current. With induction motor loads, or combination loads, it would be difficult to assign a definite acceptable factor of secondary current drop; under this condition, a transformer having a short circuit of small value may be passed as a good transformer.

Quite recently a transformer was found on our system which caused a meter to record at —7 per cent; if our tolerance had been so liberal this transformer would have continued in service.

I do not believe many testers would acknowledge that the addition of a multi-range ammeter, a 15-ohm, 5-amp. resistor, a shunting switch and leads would be a very small addition to a one-man tester's luggage if public conveyances were the only transportation provided.

WILLIAM PLOETZ,
Chief Meterman
Primary Meter Testing Branch
Philadelphia Electric Company.


BE GUIDED
by facts, not claims
by service records, not initial tests
by experience, not prophecy
The 11,000 volt generator leads on these Turbo-Alternators of the 59th Street Power Station of the Interborough Rapid Transit Co. New York City, are all single conductor braided
KERITE CABLES
INSTALLED IN 1909, 1910, 1911
They have all given and are still giving continuous and satisfactory service.
THE KERITE MFG. COMPANY INC
35

ELECTRICAL WORLD

NOVEMBER 19, 1938

An Appraisal of the Elections

While it is too early to get an undistorted picture of the full significance of the results of the recent election, the immediate effect has been to hearten business greatly. The definite swing toward the more conservative element in both parties, the defeat of extreme liberalists and the refusal of the public to stand for alliances of public officials with radical labor elements is positive proof that the American people are not ready to renounce the fundamentals of democracy.

On the other hand, no greater mistake could be made by any one, or any group of business, than to believe that this turn in the swing means a return to pre-New Deal conditions. Whatever our personal feelings may be with respect to the New Deal, the fact is that social and economic conditions have changed, and the sooner we acknowledge that situation and so steer our course the better progress we shall make.

The most comforting thing in the recent elections is the knowledge that more concern will be shown for the goose that lays the golden eggs of taxes and employment. Proposed legislation that would further restrict business by regulation or by tax burdens is almost certain to meet defeat. It would be surprising, indeed, if any further federal appropriations were voted for loans and grants to municipalities that want to buy out or compete with private utility service.

Likewise, it is reasonable to assume that water power as an accompaniment to flood control is a dead issue, that further development of federal hydro projects not now in process will cease, that REA will never again secure as large an appropriation as it has for the current fiscal year.

While the changes in the House and the Senate did not give the Republicans a majority, it is possible that alliances among conservatives might be of such strength as to effect some modifications of already-enacted legislation that would be desirable to business. It might also assert its strength in regulating the activities of some of the new federal agencies which have been decidedly leftish and anti-private business.

While the election of conservatives is something for business rejoicing, a word of caution should be given. This is not time for business to go reactionary. In fact, the election, if anything, is an opportunity for the critics of the New Deal to solidify whatever constructive economic and social steps that have been taken and build thereon.

There is a closer relationship between business and politics than ever existed before. Some of it is economic and some social. To leave the administration of measures that regulate or limit the operations of business entirely to politicians and theorists is wrong. Business must take a hand in government just as government has taken a hand in business.

The only reason in the world that the New Deal ever won in the first place was because the masses had lost confidence in business and so were willing to try different methods to bring back prosperity. Paying the left hand with the right hand doesn't do much good for the whole, and people are beginning to find that out. Is business ready now to take leadership in bringing the country back to sound conditions?

Our labor laws are not yet right or equitable; social security needs modification in the interests of both labor and business; the expense of government must be paid and business must carry its share of the burden, but how; the problem of unemployment must be met in some other way than by relief and pump priming; the awful muddle of the government in its federal hydro projects must be corrected so that these huge public expenditures may be utilized sanely.

There are other problems, but these are sufficient to indicate the scope of business' opportunity. America again looks to business. We hope its leaders are too big to be small, too progressive to look backward, too quick to be slow to accept this responsibility.

Ground Line Treatment of Standing Poles

By F. W. PACKER*

Pennsylvvania Power & Light Company, Allentown, Pa.

INQUIRY among some 30 utilities reveals experiences which appear to warrant the following conclusions about prevailing methods of treating standing poles at the ground line:

1. Charring and spraying has been employed to the greatest extent by companies engaged in this type of work on a large scale.

2. Osmose compounds have been found satisfactory only from the standpoint of application and apparent results from some increment borings. Experimental installations have been quite extensive and the next few years will probably furnish data for the general approval or disapproval of this application.

3. Anaconda wood preservative paste and pellets have proved satisfactory in many cases, although great care must be exercised in their use to safeguard the danger to persons and cattle as well as pollution of any water supplies.

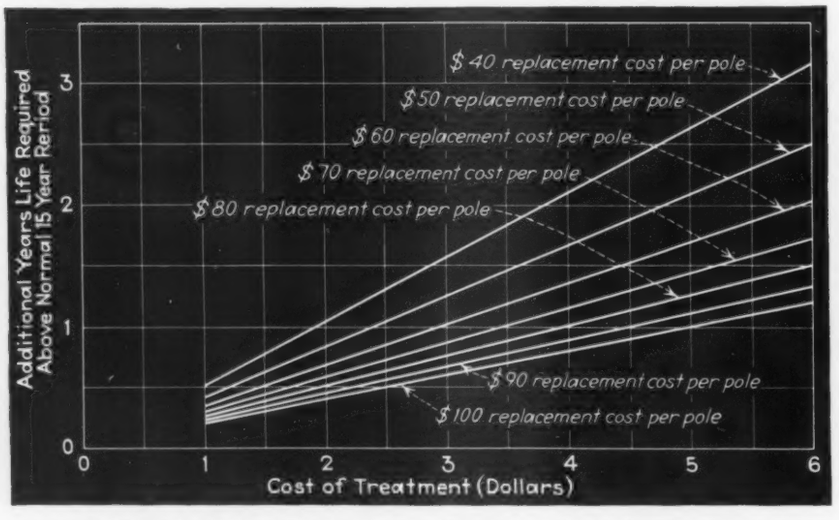
4. Coal gas tar and water gas tar are being used to a limited extent, although this method is not as thorough as some other methods. A small supply of this material can be carried on a truck in a drum and used as a "fill-in" job by a few members of a line crew which otherwise would be waiting until the balance of the crew finished the work being done in that vicinity.

5. All other forms of preservative treatment have been used on such a small scale and mostly in such an experimental manner that no definite conclusions can be formed as to their relative merits.

6. Should circumstances require the setting of a pole without initial treatment, it will be most effective and beneficial to have such pole treated as installed or within a few months afterward.

7. It is apparent from the vast improvement in the technique of preservative treatment for new poles that the necessity for supplementary treatments at the ground line of standing poles will eventually not be a major problem.

* Abridgment of analysis of replies to questionnaire circulated by E.E.I. transmission and distribution committee and reported at Old Point Comfort sessions, October 10–12, 1938.



Balancing life prolongation against pole and treatment cost

Savings result when the treatment extends the pole's life a greater number of years than shown by the curves above. Assumptions—Fifteen-year normal life; total cost of replacement from $40 to $100; supplementary treatment applied at end of eleventh year; interest on investment, 6 per cent; taxes per annum, 2 per cent; depreciation-annuity factor of 6 per cent.

Charring and spraying

The most widely used method for the treatment of standing poles is the charring and spraying method. While other methods have been tried with some degree of success by various companies, the charring and spraying method has been used very successfully in Pennsylvania over a period of approximately 21 years. The Pennsylvania Power & Light Company has treated approximately 115,000 poles in this manner during the last three years, at an average cost of $1.16 per pole. Cleaning and conditioniong of present poles prior to the charring and spraying are costing approximately $0.20, most of which labor expense will be saved in the future cycle of treatments and result in a unit cost approximating $0.95 to $1 at present labor rates.

In treating standing poles in this manner, the earth surrounding the pole is excavated to a depth of 18 in. below the ground line. The section of the pole from 1 ft. above the ground line to 18 in. below ground line is then cleaned by the use of a hatchet and long-handled chisel. All chips and refuse are removed, after which the surface of the pole is charred by use of a torch (burning a liquid gas known as "Hopane"), which quickly evaporates excess moisture found near the surface, opens up checks and cracks and produces a coating of charcoal which tends to reduce decay and readily absorb preservatives. Creosote, heated to a temperature of 185 to 200 deg. F., is sprayed over the entire cleaned surface of the pole under about 40 lb. pressure while the charred section is still hot and until the pole surface, including all cracks, is completely saturated. Poles are not back-filled until the pole has been permitted to dry for 24 hours or more. The most favorable time of the year for this application is between May 15 and October 1.

The use of Osmose compounds

seems to be quite general. Briefly, the Osmose process consists of covering the surface of the wood with a patented paste compound containing such well-known preservatives as sodium fluoride, dinitrophenol, sodium bichromate and a glutinous colloid, and then depending on the natural phenomena of osmosis to secure penetration. The wood to be treated should contain a reasonable percentage of moisture, and since a large number of standing poles are usually wet in the vicinity of the ground line it is believed that this method may prove to be quite effective. The most favorable time of the year for this application is from April 1 to May 15 and October 1 to December 15 or until the ground freezes.

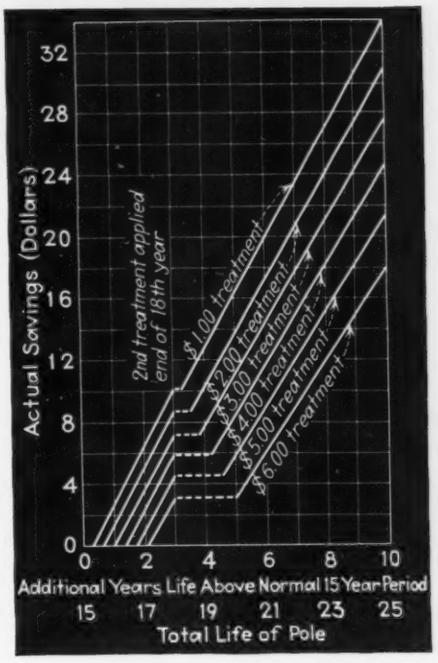
To treat a standing pole in this manner, a hole is dug about 12 to 18 in. deep around the pole and the outer surface cleaned of all decayed wood, after which the preservative compound is applied with a brush. Then to protect and retain the compound, a waterproof paper bandage is wound spirally around the treated area and secured with tacks. After this, the hole is back-filled, completing the treatment.

The Pennsylvania Power & Light Company to date has treated about 18,000 poles by this method at an average cost of $1.24 for both labor and material. Of this amount, 40 cents represents the cost of the material. Recent analyses of increment borings removed from poles treated in this manner have shown encouraging results as to penetration and of a concentration sufficient to arrest decay. While this method does not have the proved background of the charring and spraying method, it is hoped that time and experience will justify its continued use and that the ground line condition of the poles will be preserved for a period of six to eight years with each application.

Other treatments

Anaconda wood preservative paste and pellets have been used to some extent with varying degrees of success. However, when applying this method of treating poles care should be exercised, as prescribed by the manufacturer, to safeguard persons and/or cattle from coming in contact with the poisonous compound or the polluting of neighboring water supplies. The cost of applications of this character appears to average between $2.11 and $4, depending, of course, on the size of the job.

Investigation has shown that both coal tar and water gas tar, by-products of illuminating gas manufacturers, are of some benefit in treating poles in scattered locations. These tars have a pronounced toxicity and it is unnecessary to heat them to facilitate application, because, when thinned by the addition of creosote and gas-main drips, they are in a liquid state even in extremely cold weather. Their chief attribute is that of low cost, the average unit cost for treating 3,500 poles in this manner having been about 65 cents.



Savings in terms of cost of treatment of $60 pole

Normal life fifteen years. First treatment added at end of eleventh year and second at end of eighteenth year.

These tars can be applied by first forming a small cone-shaped opening around the pole to a depth of about 6 to 8 in. with the use of a special wedge-shaped tool. Usually a mixture of creosote and coal gas tar is then poured into this opening, the theory being that a certain amount of the preparation will be absorbed by the pole and at the same time sterilize the soil surrounding the pole. About three gallons of solution is required per pole, which amount appears to fill the recess, thus insuring contact with the wood for a time, dependent upon the porosity of the soil. Coal tar costs about 10 cents and water gas tar about 5 cents per gallon. However, the amount of creosote oil absorbed by the pole is questionable and the amount of treating by this method has been on purely an experimental basis.

Permo compound

Another treatment given a thorough trial was "Permo," a manufactured blown asphalt and wax compound. This is a solid black material which, when heated to about 350 deg. F., becomes a liquid, having the consistency of water.

Before applying, the ground is removed from around the pole to a depth of about 30 in., all cracks and checks are cleaned with a pointed tool and all deteriorated wood is removed. A spiral spacer spring is then placed around the portion of the pole in the uncovered section, over which a piece of paper, resembling roofing paper, is placed in tubular form. This is fastened with gummed paper strips and the joints are pinned with T pins. Moist clay is then packed around the bottom of the paper to seal it. After heating to 350 deg. F., the compound is poured between the pole and the paper, the theory being that the excessive heat will drive out moisture, kill all life, and when cool will form a protective shell around the pole which will keep moisture away. Actual application shows that about $2 worth of the material is required per pole. It was also found that the material congealed before penetrating very far into checks and cracks, thus leaving voids.

Creosoted felt wrapping

In 1935 the Cincinnati Gas & Electric Company developed a new method of applying creosote and has now applied it to some 2,000 cedar poles at an estimated cost of $5 per pole. While the cost is more than many other methods, the technique is interesting.

Briefly, the initial supplementary treatment requires removing the earth around the pole to the depth of about 30 in. After all rot has been removed, a bandage of absorbent roofing felt, 2 in. wide, is wrapped around the pole for a distance of about 24 in., with about 3 in. extending above the ground line. The edges of the felt are butted together and wrapped with a thin aluminum tape, 2 in. wide, giving the effect of a bandage around the pole. The bottom end of the wrapping is sealed with a roofing cement and dirt is tamped around the lower section to prevent the escaping of excess creosote. About two gallons of creosote is then heated to the boiling point and poured very slowly into the top of wrapping until it becomes saturated. The top of the form is then sealed with roofing cement and the pole is immediately backfilled. The average cost of material, including creosote, is $1.10 and the labor varies according to the condition of the poles being treated. Subsequent borings have indicated a fair amount of penetration and this type of treatment may prove of considerable merit in the future.

Miscellaneous processes

Many other types of treatment have been tried by various companies, but on such a small scale as to render difficult any definite conclusions as to their merit. Such treatments might briefly be mentioned, as follows:

Crank case oil.
Pfisterizing.
Creosote brush treatment.
Zinc chloride treatment.

The following additional methods have received general consideration in Canada.

1. Sand-creosote collar method developed by the Hydro-Electric Power Commission.
2. Peat-creosote collar or "Rot-Tox" de-

[*Continued on page* 109]

Pipe Painting and Drying

By H. VAN WYK

Puget Sound Power & Light Company, Seattle

WHEN the Puget Sound Machinery Depot and Western Pipe and Tank Company received the contract for supplying a quantity of 55-in. diameter water pipe for the city of Everett, Wash., consideration was given to steam, gas and electric power as heat sources for the painting and drying operations. Electric heat won out because of its flexibility, accuracy of control and over-all economy, including low installation cost and the high salvage value of the equipment. Reduced fire hazard was also a favorable consideration.

The problem was to heat three large temporary buildings in which the 40-ft. lengths of pipe were initially preheated and then dried and to maintain the heavy asphaltic paint at a temperature which would permit rapid spraying. This was accomplished by the installation of 145 kw. of various types of heating equipment, although only 110 kw. were used, because with the speed resulting from electric heat it was not necessary to use one building.

Unit heaters warm room

Two systems of heating the three uninsulated buildings were considered. Building No. 1 was 42x155 ft. with a sloped roof ranging from 9.5 to 12.5 ft. in height. Buildings Nos. 2 and 3 were 40x102 ft. and 40x122 ft., respectively, with the same roof heights as No. 1. Each building would hold 25 of the 3½-ton pipe sections. A forced-air duct system which would give better distribution of the heated air and closer humidity control was discarded, because of its higher initial cost, and a system of unit heater finally employed.

Seven 5-kw. unit heaters were installed in each building. These were built locally. The heating elements consisted of Chromalox finstrips with a 10-in., 600-cu.ft. per minute fan mounted behind the elements. Three-phase, 440-volt series parallel connections were used on the elements with 110-volt, single-phase service to the fans. The finstrips were protected with a thermocouple and controlled by a thermostat and contactor. The fans were manually controlled and were kept running continuously to take advantage of air recirculation.

The installation was designed to produce a 70-deg. F. inside temperature against April weather average of 62 deg. maximum and 45 deg. minimum. After completion the decision was made to operate at 80 deg. The equipment was able to provide this higher temperature without difficulty.

Due to the heavy consistency of the asphaltic enamel used on the pipe, it was necessary to heat and maintain the paint at a temperature of 100 deg. in order to secure rapid spraying and an even density. This temperature was maintained from storage tank to point of application by electric heating. The two heating and storage tanks were each equipped with two 7.5-kw. insert heaters set in water jackets. The 10-gal. pressure tanks on the spray machines were equipped with 3-kw. insert heaters. The problem of heating the two 40-ft. pipes on each spray machine which carried the paint from the pressure tank to the nozzles was solved by wrapping each pipe with 1 kw. of soil heating cable. These were then inclosed in three-layer asbestos pipe covering.

System readily controlled

Power supply to this installation was three phase, 220 volts, with the load divided between phases as follows: No. 1 heating and storage tank (15 kw.), phase one; No. 2 heating and storage tank (15 kw.), phase two; two pressure tanks (6 kw.) and four spray pipes (4 kw.), phase three. Control was automatic through thermostats and contactors.

Production was started in May, 1937, and completed in November. An average of fifteen pipe sections per day was turned out. Consumption for the job is shown in the table. Operation was satisfactory from all standpoints. Due to the extreme flexibility of the unit heaters it was possible to control the temperature in any part of the buildings separately to increase or decrease the drying speed. Because the job was of a temporary nature, high salvage value of the heating equipment was an important factor. Electric heating equipment possessed the highest salvage ratio.

In addition to the heating load approximately 208 hp. of electric welding equipment and compressor and miscellaneous motors were installed.

Consumption Data for 110-Kw. Pipe Painting and Drying Installation

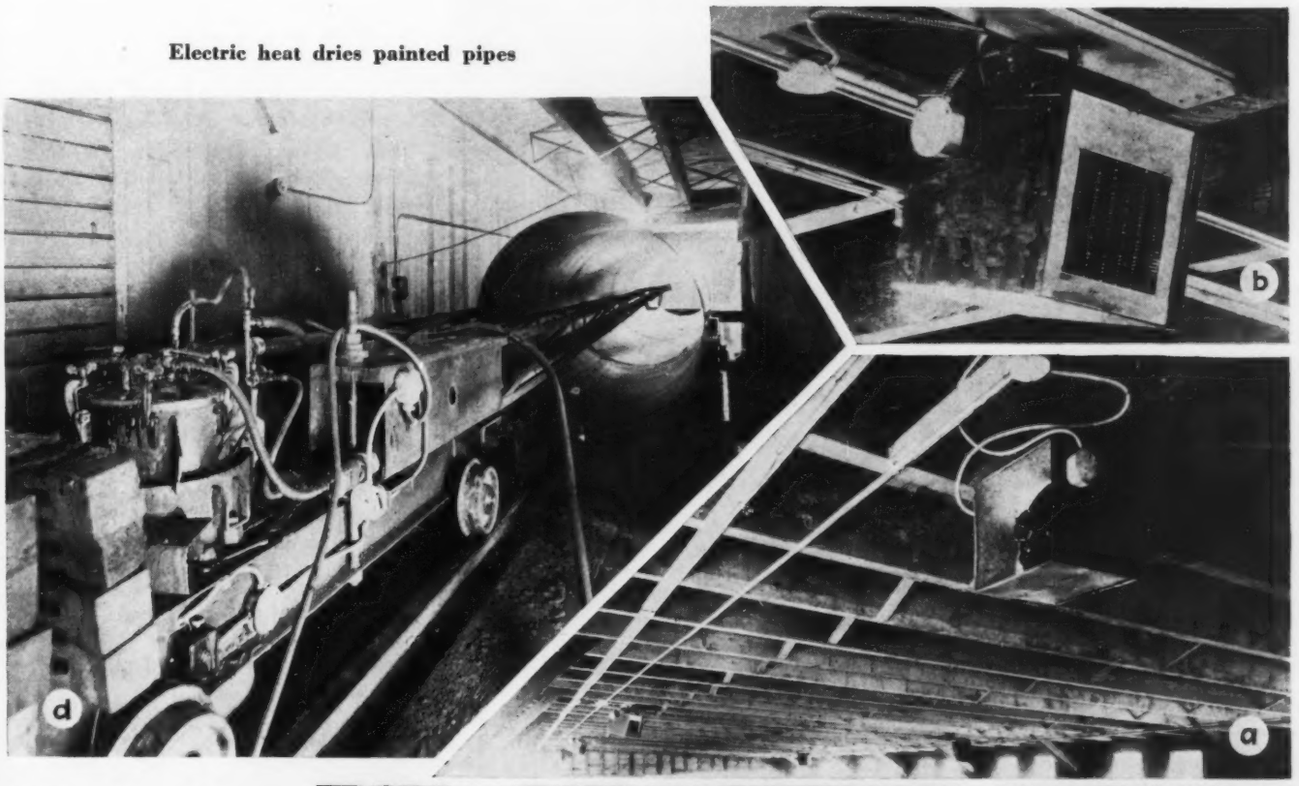
Reading Date	Consumption	Max. Av. Monthly Temp.	Min. Av. Monthly Temp.	Mean Monthly Temp.
6–25–37	10,720	71.4	54.3	63.0
7–26–37	7,390	75.3	56.3	65.8
8–25–37	7,230	72.8	56.0	64.4
9–24–37	7,800	68.5	53.5	61.0
10–25–37	22,230	63.7	49.7	56.7
11–24–37	3,200	53.4	44.3	48.8
	May weather report	65.4	48.0	56.7

The operation was completed in the second week of November and very little consumption is shown as a result thereof. Part of the job was started in May, 1937. The higher reading on 6–25–37 is caused by colder weather. Also, calculations for installed kw. were made to take care of the two extremes in May and November. Estimated consumption for those periods was 26,472 kw.-hr. per month and the reading of 10–25–37 bears out that the estimated consumption and actual consumption were very close.

Speeded With Electric Heat

Heating Load of 110 Kw. Wins Out Over Competitive Fuels Because of Economy, Flexibility, Low Fire Hazard

Electric heat dries painted pipes

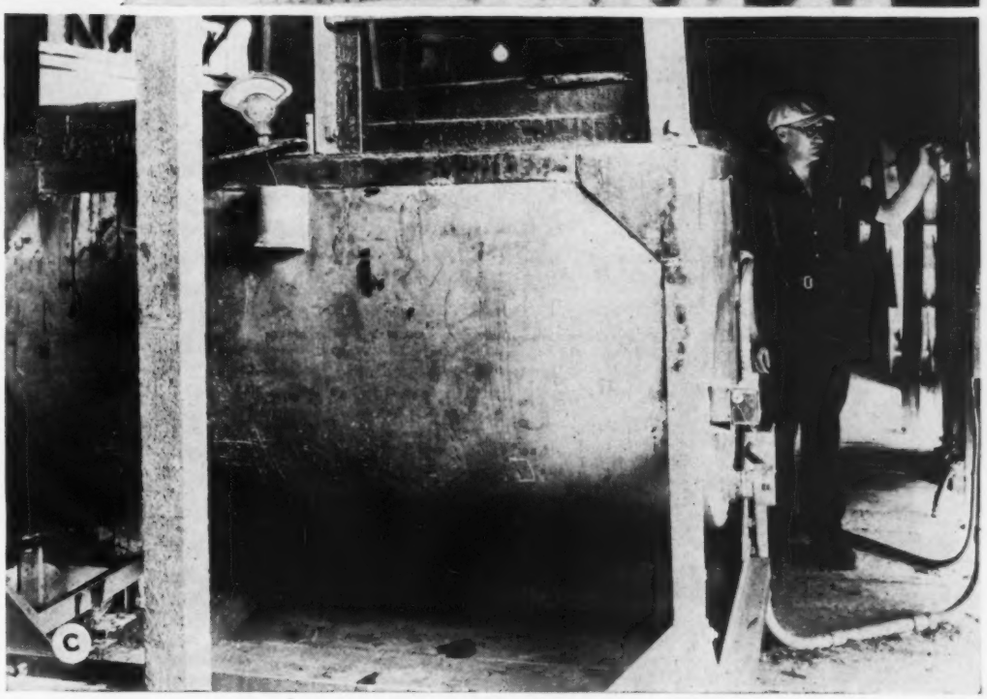


(a) Seven 5-kw. unit heaters were installed close to the ceiling of the buildings in which 25 of the 55-in. diameter pipe sections were dried after painting.

(b) The unit heaters were locally built, consisting of finstrips backed by a 600-cu.ft. per minute fan. A thermocouple protected the element and the unit was thermostatically controlled.

(c) Water-jacketed tanks heated the asphaltic enamel to 100 deg. and then maintained that temperature by means of two 7½-kw. insert heaters.

(d) As the pipe section was turned on rollers, the traveling spray machine with its two 40-ft. nozzle arms moved forward, painting both the inside and outside simultaneously. The pressure tank on the machine was heated with a 3-kw. insert unit and each of the pipes on the nozzle arms with 1 kw. of soil heating cable.



Glass Fiber Enters Electrical Insulation Field

GLASS FIBER has arrived at a significant stage of development in the electrical insulation field. It introduces the properties of an inorganic substance which appears to be capable of being used effectively throughout most of the field served by Class B insulations.

The future of this material in the electrical field seems assured by its distinctive performance under severe operating conditions. Electrical equipment already insulated with glass fibers appears to withstand severe conditions of acid, oil or corrosive vapor and that of high temperature to an unusual degree. It is under these very conditions, however, that it depends upon the efficacy of the impregnants, coatings and interstice-filling materials devised to keep pace with the glass. This is particularly true as its use advances upward from the temperature limitations inherently imposed by nature upon the long-standing cellulose insulations. Present resins for this purpose are generally satisfactory for Class B temperature limits (125 deg. C. maximum temperature), but they are known to deteriorate over long periods at high temperature. However, as higher-temperature resins are developed they can be expected to expand the possibilities of glass relatively to a greater extent than those of prevailing Class B insulation bases. When improved resins become available there seems to be no reason why the temperature limitation of 125 deg. C. should not be raised very appreciably—at least for glass fiber, if not somewhat for cotton and other insulations.

This is the conclusion reached after observation of the captivating process by which the molten glass is drawn into filaments, after noting where it has already been adopted and after being exposed to the aims and objectives of those who are engaged in entering the insulation field with a product that they hope may prove to revolutionize our current ideas about ratings for electrical equipment.

These potentialities of glass in fiber form are attributable to the physical, thermal and electrical properties of an inorganic substance that cannot carbonize, is capable of wide range of compositions and of heat and chemical treatment, is readily being drawn into 0.00023-in. diameter filaments and retains its properties far beyond the temperatures at which the sustained magnetic properties of the associated cores would warrant operation of the equipment. In strength the fibers vie with piano steel wire. For extremely fine diameters, test values for the fiber have been reported up to 1,000,000 lb. per square inch. Very hard piano wires have reported tensile strengths up to 330,000 lb. per square inch. The glass fibers of these fine diameters carry surface properties which establish their toughness and pliability characteristics.

The individual fibers, being solid, will not absorb moisture. However, glass surfaces will adsorb small amounts of moisture which can produce adverse results in unimpregnated glass textiles where the ratio of surface to volume may be several thousand times what it is in a piece of glass of ordinary sections. A very high electrical resistance can be assured by the use of special grades of glass to minimize the effect of such adsorbed moisture. For example,

Robert Yarnall Richie Photo—Corning Glass Works

Invisible fibers gathered into visible silver

Molten glass extruded through very fine orifices at bottom of furnace above. Fibers gathered into "sliver" and wound on spool for later textile finishing operations (yarns, weaves, braids, tapes).

Physical Properties of Fiber Glass as Electrical Insulation

1. Non-inflammable (being 100 per cent inorganic).
2. Capable of extremely high temperature operation (limited by impregnation).
3. Very great tensile strength.
4. Non-hygroscopic.
5. High insulation resistance.
6. Excellent dielectric breakdown strength, when impregnated.
7. Resists attack by moisture, acids, oils and corrosive vapors.
8. Good thermal conductivity.
9. Excellent space factor and impregnating qualities.
10. Excellent appearance.

Insulation Resistance of One-Inch Square Samples of Standard Tapes After Three Days at 100 Deg. F.

	Cotton 0.011 x 1 In.	Non-Ferrous Asbestos 0.015 x 1 In.	Style AC Type E Glass 0.015 x 1 In.
		Unwashed	
90% R.H.	1.03	0.57	12.4
75% R.H.	35	1.08	200
		Washed	
90% R.H.	30.5	1.5	1,400
75% R.H.	380	5.5	30,000

the composition can be shown to render the electrical resistivity practically twice that of cotton at 60 per cent relative humidity and 24 times as high at 98 per cent. Compared with non-ferrous asbestos the appropriate composition stands (at 98 per cent relative humidity) in the ratio of 2,400 to 2.7 megohms per inch of 5-grain-per-yard yarn. Impregnation is, of course, the answer for all substances where voltage makes dielectric strength a ruling factor in the insulation decision.

Dielectrically glass has quite favorable properties. Typical compositions have a breakdown strength of 3,000 volts per mil for solid sections, but the air interstices of any fibrous material, especially if woven, make the dielectric strength of air (80 volts per mil) the decisive factor. Again the answer is impregnation to substitute some solid, usually a resin, for the dielectrically weak air. The crux of the situation is manifestly the properties that can be imparted to the impregnant. Research is developing some semi-inorganic resins which bid fair to carry well above 300 deg. C. They are thermoplastic rather than brittle at high temperatures, have good bonding and dielectric properties. This research makes a hopeful start in assuring for glass fiber the high temperature potentialities which it presents as a substance.

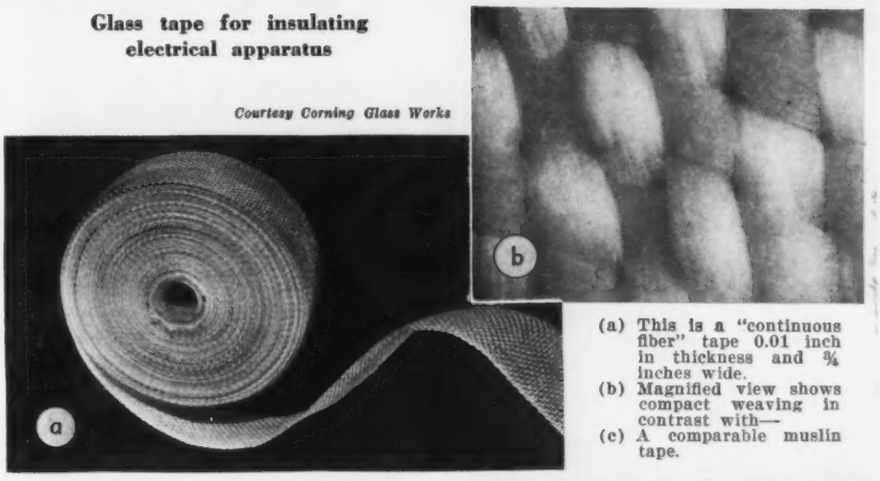
Courtesy Corning Glass Works

Threads converted into yarns on conventional textile machinery

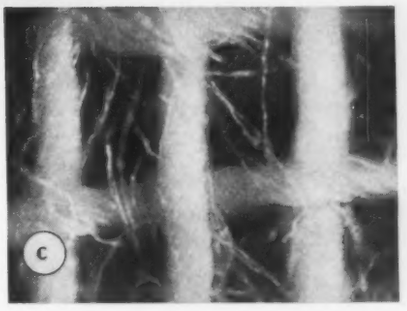
Each thread consists of 102 individual glass filaments 0.0002 in. in diameter.

Glass tape for insulating electrical apparatus

Courtesy Corning Glass Works



(a) This is a "continuous fiber" tape 0.01 inch in thickness and ¾ inches wide.
(b) Magnified view shows compact weaving in contrast with—
(c) A comparable muslin tape.



Glass fibers have show a particular adaptability in the fabrication of various insulations (such as thin tapes, wire coverings, etc.) which permit the use of reduced insulation thickness and thus space devoted to insulation. The resulting increase in copper in the slots is found to vary with the size and type of machine, from perhaps 10 to 15 per cent or even more in certain smaller machines to a relatively negligible amount in large turbine generators. Field slot armor may eventually be considerably reduced in thickness. In the former case, however, increased rating will result not only from the greater copper sections but also from the shorter heat path from the copper to the iron, thus affording better heat dissipation. Getting more current into a motor without occasioning increased losses makes for higher ratings because of the enhanced torque. If the economics warrant it the losses and the operating temperature can also be permitted to rise substantially without risk of deterioration of the glass insulation and its impregnant.

Apparatus ratings enhanced

Otherwise identical designs of welding generators are said to be delivering doubled amperage. Particularly in the smaller motors the economic advantage of substituting a Class B insulation has resulted in adoption of glass to raise the operating temperature above 125 deg. C.

Add space factor and thermal properties of glass together, recall that a critical limitation of the small motor is the absence of slot insulation, sense that glass fiber can be used to insulate wires as small as No. 40, it can be seen that glass offers the opportunity to substitute Class B for Class A insulation, obtaining the same space factors, but with higher ratings, in consequence of the B classification of the insulation.

For the larger alternators and synchronous motors the space factor gains are generally less than for the smaller ratings. The big factor here is moisture absorption or adsorption and the glass tapes (woven either from "continuous" fibers or "staple" fibers 6 to 15 in. long) afford good performance in this respect because individual glass fibers are solid in a sense not true of cotton or asbestos.

In transformers present oils are prone to sludge at about the same temperature at which cotton and paper tend to carbonize and dissolve in the oil. Glass insulation here affords the prospect of a distribution transformer which might never have to have a sludged oil replaced, especially if current research can do other things to reduce the sludging conditions and sludging propensities of transformer oils. It seems also that glass fiber insulation can be expected to receive consideration, particularly in connection with a possible trend toward air-cooled transformers as one of the alternatives to

Courtesy Owens-Illinois Glass Company

Standard continuous filament yarn being woven into 0.005-in. cloth for electrical insulation

oil-cooled transformers where oil fires constitute a cause for concern. There its space factor and thermal advantages appear to avert some of the difficulties encountered when air-cooled designs run into inordinately large dimensions in an effort to provide adequate cooling surface and ventilating ducts ample to provide circulation unimpeded by dust accumulations. Considering, however, the insistent pressure for enhanced ratings for rotating electrical machinery, it seems as if that field can be expected to move slightly faster toward glass than the transformer.

The wire field

For magnet wire the space factor and thermal properties give glass a basic combination of merits for adoption. Magnet wire in round and rectangular form is being insulated with parallel glass threads (no braiding) and treated with varnish for smooth surface and abrasion resistance. For these reasons there is the prospect that silk insulation may some day share the field with glass fibers in the relays and coils used in the communication field. Permanency and minimum maintenance of equipment will be the attractive factors.

Advantages of glass insulation on wires, especially those devised for high temperature uses, are thus:

1. Better electrical characteristics.
2. Better mechanical characteristics.
3. Less wall thickness (better space factor).
4. Can be applied to fine wire sizes.
5. More permanent.
6. Lower maintenance cost.
7. Withstands higher temperature.
8. Withstands oil, acids and corrosive vapor.
9. Does not absorb moisture.

Comparative Tensile Strength of Fibrous Insulating Materials

Results are average of five tests on the same roll of tape.
Room condition approximately 80 deg. F., 60 per cent relative humidity.

Material					Tensile Strength (Pounds)	
Name	Quality	Size, Inches	Identification		At Room Condition	After Heating 570° F. for 5 Minutes
Glass batch E	Alkali free	0.025 x 1	28E 10P	Staple	399	378
Glass batch E	Alkali free	0.015 x 1	28E 16.5P	Staple	263	251
Glass batch E	Alkali free	0.015 x 1	28E 16.5P	Continuous	674	629
Glass batch E	Alkali free	0.010 x 1	28E 16.5P	Continuous	510	495
Glass batch E	Alkali free	0.005 x ½	.....	Continuous	172	161
Asbestos	.....	0.025 x 1	33E 15P	Commercial	50	15
Asbestos	.....	0.015 x 1	28E 17P	Commercial	25	12
Asbestos	.....	0.010 x 1	32E 18P	Underwriters	19	11
Asbestos	.....	0.025 x 1	26E 13P	Underwriters	130	71
Asbestos	.....	0.015 x 1	30E 17P	Underwriters	42	20
Cotton	.....	0.011 x 1	60E 32P	.....	87	..
Cotton	.....	0.005 x ¾	56E 36P	.....	26	..

In the heavier wires, where insulations are of the order of $\frac{1}{32}$ in., there is a field for glass. Particularly in mind is electric range wire. It is expected that it will compete with the grades of asbestos used in flexible cords in the case of heaters and flatirons and portable cooking utensils. Also, it does appear to deserve a tryout in the cable field, more particularly those like the underground network where burn-clear, gas-free, noncarbonizing properties of the insulation are paramount. Cable manufacturers are manifesting a comparable interest in glass for the intermediate voltage ranges, much of the reticence about applying it for the higher voltages being a matter of establishing confidence in the impregnating resins. Any reticence is also a logical consequence of years of habitual reliance on hydrocarbon impregnants which lack the freedom of glass from carbonization.

Other electrical uses

Other applications of glass fiber than insulation of conductors and coils have appropriately been made in the electrical industry. It is being used in batteries as retainers of active material detached from the plates. Similarly anode bags of glass cloth catch the detached material in plating operations. Glass here withstands acids that asbestos cannot combat. Diaphragms of glass cloth are being used in electrolytic cell practice. It has proved effective in the form of gaskets between units in a stacked insulator assembly. In conjunction with suitable binders it is capable of flat sheet fabrication for use in control apparatus, field coils, electromagnets, etc., as well as for spacers in electrolytic condensers, if not even in the form of glass paper in foil-type condensers.

These, in general, are the uses within the electrical industry for the sake of electrical and chemical properties. The thermal properties of glass fiber, however, are not to be ignored in considering the incidence of the new product on the electrical industry.

It is being used in power plants for insulating high-temperature, high-pressure steam lines where about 1,050 deg. F. is the present temperature limit of the material. These are just typical random applications.

But it is in the industries which

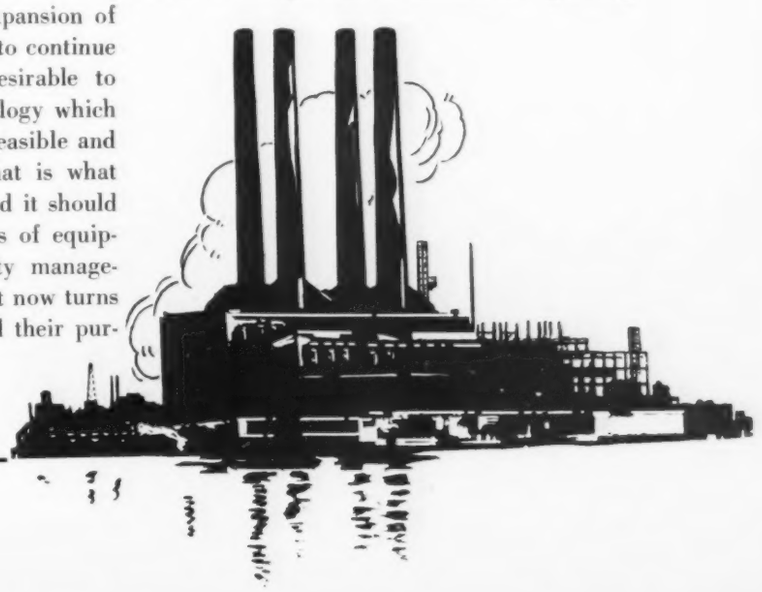
[*Continued on page* 110]

STEAM STATION
EXPANSION PROBLEMS

ADDITIONS to power plant capacity among electric utilities must go on both for replacement of obsolete units and for the increases required for the growth now marking time. Quite naturally, under prevailing conditions, there is less emphasis upon the ultimate in thermodynamic efficiencies and relatively much more emphasis on maximum conservation of investment. As a consequence, the current increments to generation capacity are largely being made in existing stations in the form of either superposed or conventional condensing units; a few wholly new plants have, however, been built. Furthermore, the trend toward additions to already established plants seems likely to continuue. This is probable not only because it makes effective use of facilities that might otherwise be partly superseded but usually it also introduces the needed augmentation near the load centers, thus minimizing the costs and losses of bulk transmission.

In many instances the stations were built to provide structural and auxiliary facilities for the units which are now being added. In many other instances, however, the stations when built were viewed as ultimate, the expectation being that technologic advances and shifts of load would dictate wholly new stations when more generation was needed. Nevertheless, technology has advanced in such direction as to warrant a reversal of those earlier tacit decisions. New metals have supported the adoption of higher boiler and turbine pressures and temperatures. New designs have led to the adoption of a doubled speed (3,600 vs. 1,800 r.p.m.) for the 60-cycle machines. Hydrogen cooling also makes a contribution. All these factors aid in permitting the installations of entire generating units in boiler, auxiliary and turbine space now occupied by much smaller units. Superposed units undoubtedly offer the greatest intrinsic gains in this respect, but the limitations of subsequent operation often offset these gains. Anyhow, this symposium is not intended to be a debate on the merits and demerits of superposition, but rather on the practical problems encountered and solved incidental to the installation of either a superposed or straight condensing unit.

These practical obstacles call for more ingenuity and resourcefulness than would the clear-cut design of a wholly new station that could make use of modern designs of all the elements going into it. The articles on the following pages demonstrate this effectively. Further, they give sufficient detail to afford, we believe, a comprehensive assembly of case treatments to be emulated in comparable situations now pending. Since the trend toward expansion of existing stations bids fair to continue for some years, it is desirable to have on record the technology which makes it both physically feasible and financially attractive. That is what this symposium serves, and it should be instructive to designers of equipment as well as to utility managements with stations that, it now turns out, have only half served their purpose.



Plant at Load Center Again Takes Base Load

Topping Reserve Battle Creek Plant Meets Load Growth at Low Cost With a Pronounced Gain in Efficiency — Novel Increment to Condensing Water

By FRANK G. BOYCE
Vice-President
Consumers Power Company
Jackson, Mich.

AMPLE supply of cooling water for full-load operation was one factor to be met in justifying a 20,000-kw. increment to the Battle Creek plant as the appropriate location for needed increase in steam-generating capacity on the system. With this problem solved in a rather unique manner the station could not only be "topped" advantageously but also applied to base-load operation.

The following benefits have resulted from the addition of the superposed 10,000-kw. unit:

1. This installation has changed this plant from a reserve plant to active base-load operation and put the plant into more active use.
2. This has also added 20,000 kw. of capacity to the system at a very low cost per kilowatt and at a location where capacity was needed.
3. The former plant operated at about 22,000 B.t.u. per kilowatt, whereas the new unit when running in conjection with 20,000 kw. of capacity in the older turbines is now delivering a kilowatt-hour at slightly below 13,000 B.t.u. per kilowatt-hour.

The plant is located in the southern part of the Consumers Power Company system at a rather strategic point where several of the 140,000-volt transmission lines meet. A good portion of the output is absorbed in the city of Battle Creek. Kalamazoo, 25 miles west, and Jackson, 45 miles east, and other nearby load centers absorb the remainder, making it possible to utilize the output with very low transmission losses. The addition has provided 30,000 kw. of highly efficient generating capacity and 20,000 kw. of capacity suitable for reserve use until such time as conditions warrant the modernization of the remainder of the plant.

Capacity for load growth

On the system of the Consumers Power Company in Michigan the increased industrial activity, the rapid increase in residential customer use of current per customer, the extensive rural line construction program and other increases in the number of customers and the use of power were reflected during the latter part of 1935 in a quite rapid increase in the kilowatt-hour output on the system and made it apparent that additional generating capacity would be needed by the fall of 1937.

As the first step in providing additional capacity, it was found most economical to construct an addition to the steam-generating plant at Battle Creek by installing a 10,000-kw., 12,500-kva. high-pressure, non-condensing turbo-generator unit exhausting into the present steam header. A single steam-generating unit capable of delivering 360,000 lb. of steam per hour at 850 lb. gage pressure, 875 deg. F. was installed to furnish the high-pressure steam for the so-called topping unit. Coal storage capacity was increased from 20,000 tons to 45,000 tons and additional circulating water supply was also provided.

Since the existing low-pressure plant contained 40,000 kw. in turbo-generator capacity with boiler capacity to supply steam for only 30,000 kw., this addition provided 20,000 kw. additional capacity in the southern part of the system, where it was most needed, at a relatively low cost per kilowatt. The more recent previous developments having been located in the eastern and western part of the system had resulted in the generating capacity in the southern section of the system lagging somewhat behind the local load growth.

The original Battle Creek plant contained three generating units:

Two 10,000-kw., 12,500-kva. General Electric 5,000-volt, 60-cycle turbo-generator units, straight condensing, one installed in 1917 and one installed in 1921, and one 20,000-kw., 25,000-kva. Westinghouse 5,000-volt, 60-cycle condensing turbo-generator unit regenerative cycle installed in 1925. These turbines operate condensing with 200 lb. steam pressure and 600 deg. F. total steam temperature. Furnishing the steam for these units were six 824-hp. B.&W. cross drum boilers fired by Taylor underfeed stokers, installed in 1921.

Although the plant was rated at 40,000 kw., the output was limited to approximately 30,000 kw. due to the lack of boiler capacity and during low steam flow periods due to lack of cooling water for the condensers. Ash disposal was taken care of by drag chain and skip hoist, to an ash silo and trucks. Coal was handled by a track hopper, flight conveyor, coal crusher, inclined and distributor belt discharging into the plant bunker, storage coal being handled by means of an overhead crane and clamshell bucket.

Limited facilities expanded

It was necessary to construct an addition (Fig. 1) to the building to house the new high-pressure boiler. The turbine was installed in the present turbine room (Fig. 4) alongside the 20,000-kw. turbine and in space formerly occupied by a frequency changer. It is designed for 750-lb. gage steam pressure, 850 deg. F. temperature at the throttle, but is safe for continuous operation with 875 lb. pressure, 900 deg. F, temperature. It is designed for a back pressure of 210 lb. gage exhausting into the present 200-lb. header and is safe for back pressure of 250 lb. gage. Under normal operation the load on this unit is controlled by the back pressure, so that increasing the load on the low-pressure unit lowers the exhaust pressure on the high-pressure unit, which reacts upon its governing mechanism to increase the load on the high-pressure unit. When desirable, however, it is possible to cut out the back-pressure regula-

tion and by setting the governor of the 20,000-kw. unit for full load the new high-pressure turbine and the 20,000-kw. turbine can be operated separately from the rest of the plant as a single unit, the load being controlled entirely by the steam supplied to the high-pressure unit, in which case the back pressure on the high-pressure turbine and the steam to the 20,000-kw. unit will vary with the load.

While the original plant was equipped with evaporators and pure water storage for boiler feed makeup, trouble had been experienced with raw water contamination due to condenser leakage. To prevent possible trouble from this source the condensers on all low-pressure generating units were retubed and adapted to the floating-head type of construction with the tubes

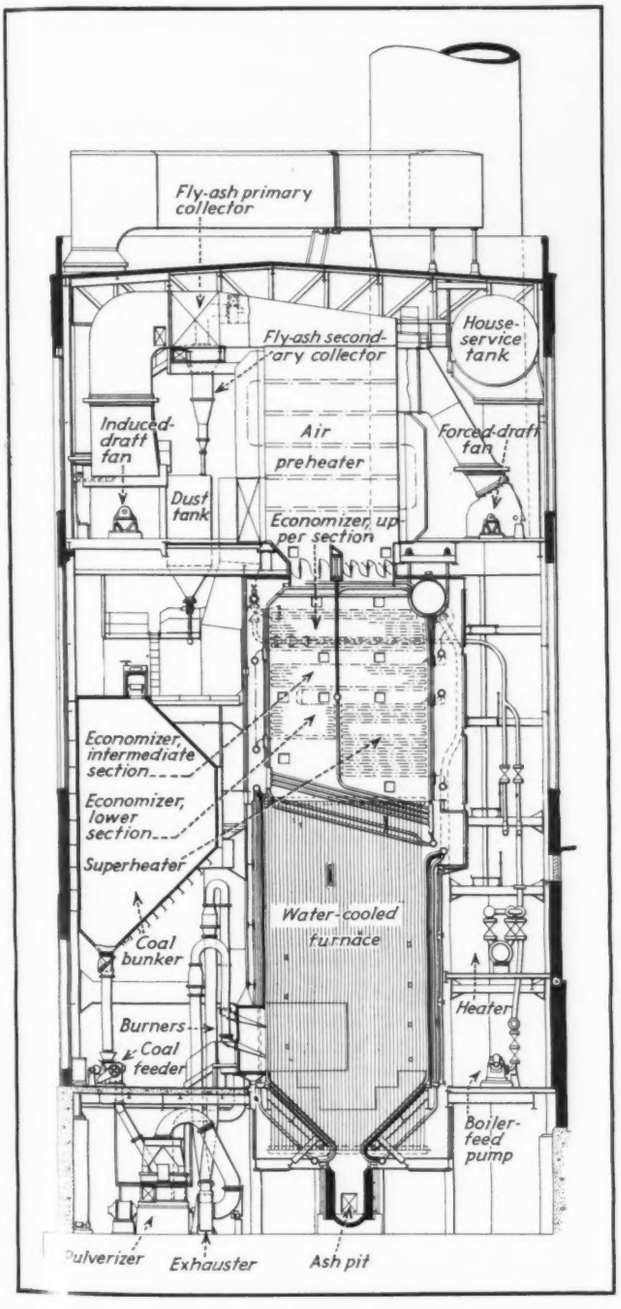


Fig. 3—Novel air preheater incorporated in steam generator

The air preheater is somewhat unusual inasmuch as the tubes are horizontal with the air flow through the tubes. The unit is capable of continuous operation with an output of 360,000 lb. of steam per hour at 850 lb. gage pressure, 875 deg. total temperature. The safety valves are set to relieve at 900 lb. pressure. The furnace of this unit is 24 ft. wide by 21 ft. deep and 43 ft. high. Water-cooled walls furnish 6,254 sq.ft. of the 31,748 sq.ft. of total water heating surface. Air preheater contains 67,633 sq.ft. of surface.

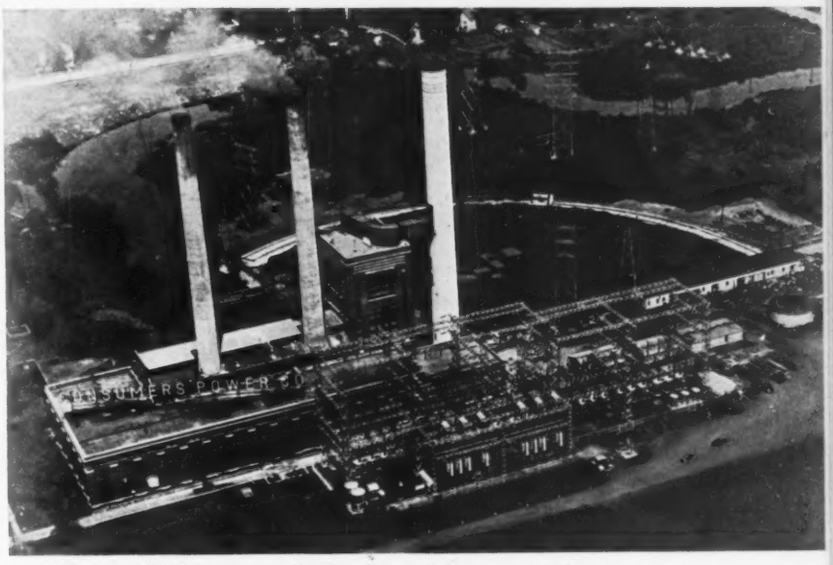


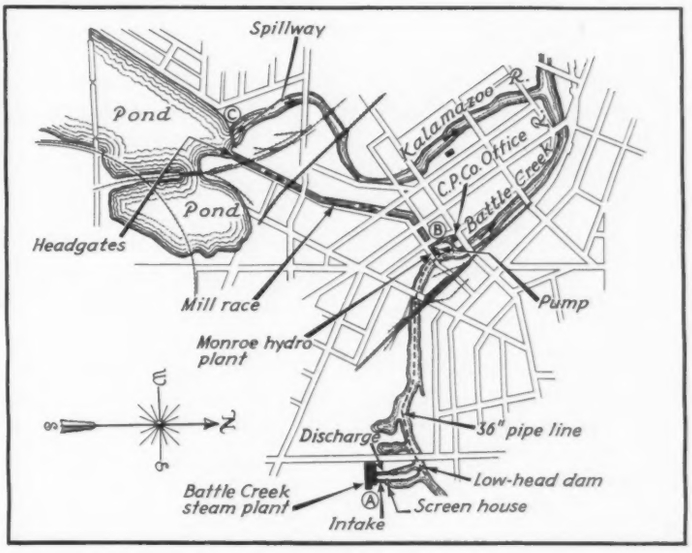
Fig. 1—High-pressure boiler housed in new section of power plant

New tall section in center to left of new chimney. Additional dragline coal storage in rear of plant. The new concrete chimney is 250 ft. high above grade level, 16 ft. in diameter at the top. Same height as and in line with the original two chimneys at this plant.

Fig. 2—River sent back upstream to augment condensing supply

The Battle Creek Steam Plant "A" is located on the Battle Creek River. This stream flows into the Kalamazoo River about one mile below the plant. The company also owns a small hydro electric plant "B" which receives its supply of water through the mill race from above the dam "C" which is located on the Kalamazoo River. A 36 in. steel pipe line was laid in the bed of the Battle Creek River from the downstream hydro plant "B" to a point on the upstream side of a low head dam at "A" which separates the intake from the discharge at the steam plant.

The elevation of the water in the mill race at the hydro plant is eight ft. higher than the water in the Battle Creek River at the intake at the steam plant which is sufficient to provide a flow of 12,000 gal. per min. by gravity through this pipe line. This quantity can be increased to 35,000 gallons per minute by the operation of a pump which was installed for this purpose at the hydro plant, and is controlled from the steam plant.



rolled in at both ends. This procedure made it possible to redesign completely the condensers on the older 10,000-kw. units, so that all the condensers now have the most modern tube arrangement, with resultant improvement in operation.

Steam Generators—The new boiler unit (Fig. 3) consists of a single vertical-pass Babcock & Wilcox steam generator combining a complete water-cooled furnace, boiler, superheater, steaming type economizer and tubular air preheater.

The economizer is placed in the upper part of the boiler setting and is divided into three sections. Arrangements are such that feedwater from the boiler feed pumps passes through a high-pressure heater into the top of the upper section of the economizer and flows downward while the gases flow upward, which is generally known as counterflow. From the upper section of the economizer the feedwater flows to the bottom of the lower section and then upward through the lower and intermediate sections and to the boiler. The water in these sections is flowing in the same direction as the gases, which is usually called parallel flow. The lower sections are designed as a steaming economizer, making parallel flow necessary in order to have the feedwater flowing upward while the upper section is counterflow to obtain best efficiency.

The boiler is divided into two parallel vertical gas passes by means of a water-cooled vertical baffle, with the superheater located in the right-hand pass immediately above the boiler tubes. The superheater, which contains 10,750 sq.ft. of heating surface, is arranged for parallel flow so that the cooler steam passes through the section which contacts the hotter gasses, which avoids the use of special alloy steel. In regular operation the dampers at the top of the right-hand pass are wide open and superheat control is accomplished by varying the amount of gas passing through the superheater by adjustment of the dampers at the top of the left-hand pass.

Pulverized Fuel—The steam generating unit is fired by pulverized fuel furnished by two Combustion Engineering Company bowl-type pulverizers, each of which has a capacity of 10 tons of coal per hour. Each pulverizer is connected to two B.&W. cross-tube burners. Ashes are removed by a sluicing system, the ashes being discharged from the unit by water jets into an ash sump, from which they are pumped by means of ash sluice pumps to low ground in the vicinity of the plant. Arrangement is such that the ash sump also receives the ashes from the drag chain conveyor from the old boilers, so that the new sluice system replaces the skip hoist and ash silo which served the old section of the plant. There is ample storage space to take care of the ash for many years of operation.

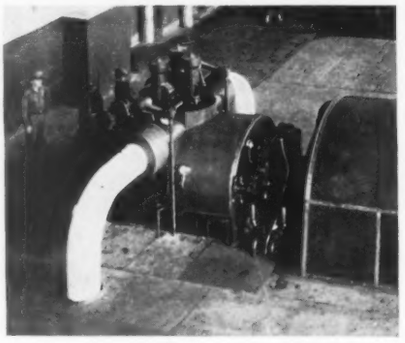


Fig. 4—New turbine in present turbine room

Space formerly occupied by frequency changer devoted to superposed turbine. Unit is a General Electric 3,600-r.p.m. turbo-generator, 10,000 kw., 12,500 kva. capacity, 60 cycle, 5,000 volts. It is designed to operate on the station bus in parallel with the older units.

Draft and Boiler Feed—The necessary draft is supplied by an induced draft fan having a capacity of 190,000 cu.ft. of gas per minute at a draft of about 12 inches of water. An American Blower Company "Separator tube" type cinder collector is installed between the air preheater and the inlet of the induced-draft fan. This removes all objectionable ash from the flue gases, which is an important requirement inasmuch as the plant is located rather close to the residential section of the city.

Air for combustion is supplied by a forced-draft fan having a capacity of approximately 105,000 cu.ft. of air per minute at a pressure of 11 inches of water.

Boiler feed is supplied by either of two 800-g.p.m., 3,600-r.p.m. motor-driven boiler feed pumps which receive water from the present 300-lb. pressure boiler feed header and deliver it to the economizer at a pressure of about 1,000 lb. per square inch. Before entering the economizer the water passes through the high-pressure heater which receives steam from the 200-lb. steam header. The water entering the economizer has a temperature of about 375 deg. F. regardless of the load on the generating unit.

A pressure-reducing and desuperheating station of about 80,000 lb. of steam per hour capacity is provided, so that the high-pressure boiler can supply steam to the low-pressure plant header for starting the low-pressure turbine when either the high-pressure turbine or low-pressure boilers are out of service, which is sufficient to develop 6,000 kw. from the low-pressure units.

Coal-Handling Expanded—Coal-handling facilities were altered by substituting a belt and bucket type elevator for part of the older inclined belt conveyor and the installation of an inclosed scraper conveyor over the new bunker. The old coal crane runway has been shortened to permit the installation of a modern dragline scraper system which has a coal-handling capacity of 100 tons per hour, either to storage or to the station bunkers. Coal storage capacity is provided so that when coal is stored to a depth of 27 ft. 39,000 tons can be stored in the new space, which, with the 6,000-ton remaining capacity of the original storage, provides a total maximum coal storage capacity at this plant of 45,000 tons.

All auxiliaries, except the condenser air ejectors, are motor-driven. The larger motors installed in connection with the new equipment operate at 2,300 volts from a new set of station power transformers, while the smaller motors operate at 480 volts from the station power transformers in the existing plant.

Other modifications

A combination passenger and freight elevator is provided in the southeast corner of the new boiler room and services the machine shop and stockroom, as well as all floors in the new boiler room.

The rather unique manner in which the deficiency in the supply of circulating water is taken care of is shown in detail in Fig. 2. The new arrangement makes it possible to utilize, during the dry season, the entire flow and pond storage capacity of the Kalamazoo River in addition to the Battle Creek River, on which the plant is located. This assures ample supply of cooling water for full-load operation at all times.

To handle the output of the new generator two 2,000-amp., 15,000-volt General Electric type H-209 oil circuit breakers were installed in an available cell structure connecting the generator to the 5,000-volt double bus. Supply for station power for the new equipment was provided by installation of a new bank of transformers rated 2,250-kva., 5,000/2,500 volts, together with a 2,500-volt bus structure and connections to the auxiliaries operating at this voltage. Only minor changes were required in the existing electrical equipment, current-limiting reactors being installed in two of the circuits feeding from the 5,000-volt bus. No changes were required in the higher-voltage equipment about the plant.

Steam Plant Expansion Key to Narragansett Program

High-Pressure Turbo Unit Scheduled for Former Railway Plant's 60-Cycle Production in Unified Power System — Increased Efficiency Sought

FOLLOWING the entrance of the Narragansett Electric Company and United Electric Railways of Providence, R. I., into the New England Power Association system, some years ago, a comprehensive engineering development took place in the interest of more reliable service to the public and more efficient electrical production in the Rhode Island metropolitan area. One of these steps was the co-ordination of the South Street and Manchester Street generating plants in an operating plan under which available economic capacity in these stations could be drawn upon through appropriate frequency-changing equipment to serve the power and traction loads of the territory. South Street generates at 60 cycles and Manchester Street at 25; both plants are located on tidewater in the heart of Providence, within a quarter of a mile of each other, and with ample fuel and condensing water facilities.

Early in 1937, in anticipation of future demands for electricity, and after exhaustive studies of development schemes, a 40,000-kw., 1,200-lb. condensing turbo unit and boiler were contracted for installation in the Manchester Street plant when load requirements warrant. The business recession postponed the date of installation temporarily, but this capacity will be available as soon as required and fits into the local power picture both flexibly and economically.

First Kw. since 1925

Since 1925 no additions have been made in generating capacity on the Narragansett system. Electrical usage in the Providence area practically doubled between 1925 and 1937, and at the beginning of last year consumption was substantially above the peak attained in 1929. In 1937 South Street had a firm capacity of approximately 10[illegible]00 kw. At the Manchester Street plant there was but 20,000 kw. of economical capacity, although plenty of space was available for additional 60-cycle units. The railway load had been reduced gradually by the use of buses. The remaining 25-cycle load was amply provided for by the above unit and the frequency-changer set connected with South Street station. The frequency set made the remaining 25-cycle capacity available to the Narragansett System and made possible its operation in conjunction with the South Street units as dictated by economy. Transmission tie circuits between South Street and the New England System at Millbury via Woonsocket constituted an emergency source and permitted economic interchange. Even with these adjuncts it became evident that additional capacity would be required.

Several plans studied

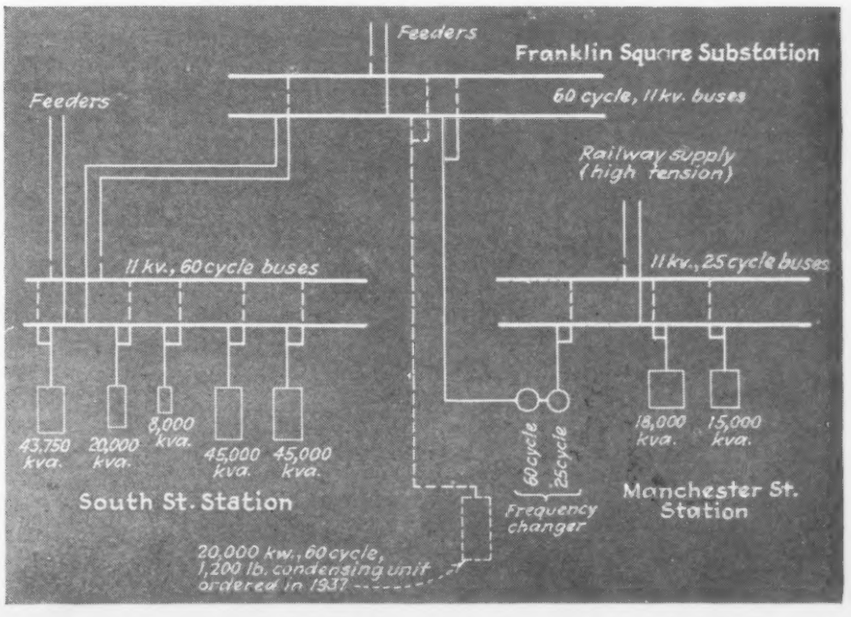
In considering the problem of capacity increase for Providence, an entirely new station was considered and found not competitive with possible extensions. Manchester Street offered space for the installation of additional efficient capacity at lower total cost than a new plant would entail.

The principal plans considered for the Providence development follow:

(A) Move and recondition a 20,000-kw., 200-lb., 500-deg. turbine (lacking boiler capacity) from South Street to Manchester Street. Install a 20-000-kw., 1,200-lb., 900-deg. topping unit exhausting at 160 lb. to this machine, and also a boiler of 380,000 lb. per hour steam capacity. Assume the operating cost of this set-up to be 100 per cent.

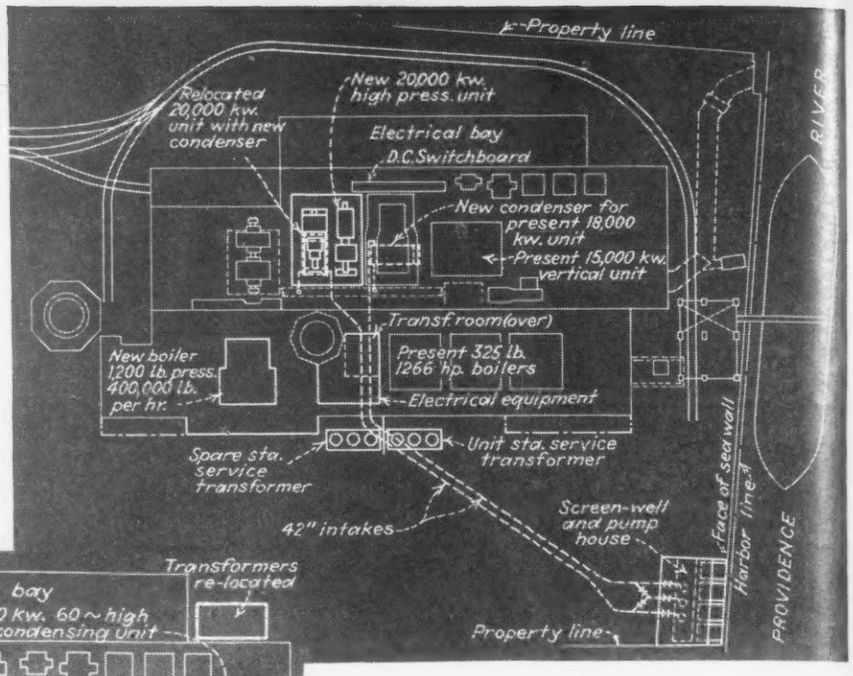
(B) Move the 20,000-kw. unit as in (A) from South to Manchester Street and superimpose a 20,000-kw. unit as in (A). Change an 18,000-kw., 300-lb., 25-cycle turbo-unit at Manchester Street into a 200-lb. machine and superpose a 1,200-lb., 900-deg. non-condensing 15,-000-kw. 60-cycle turbine on it and add two new boilers instead of one for the combination of units made available by transfer and purchase. This scheme can be operated at 89 per cent of the operating cost of scheme (A).

General arrangement of steam plant units and bus ties to Franklin Square substation, 1938 situation

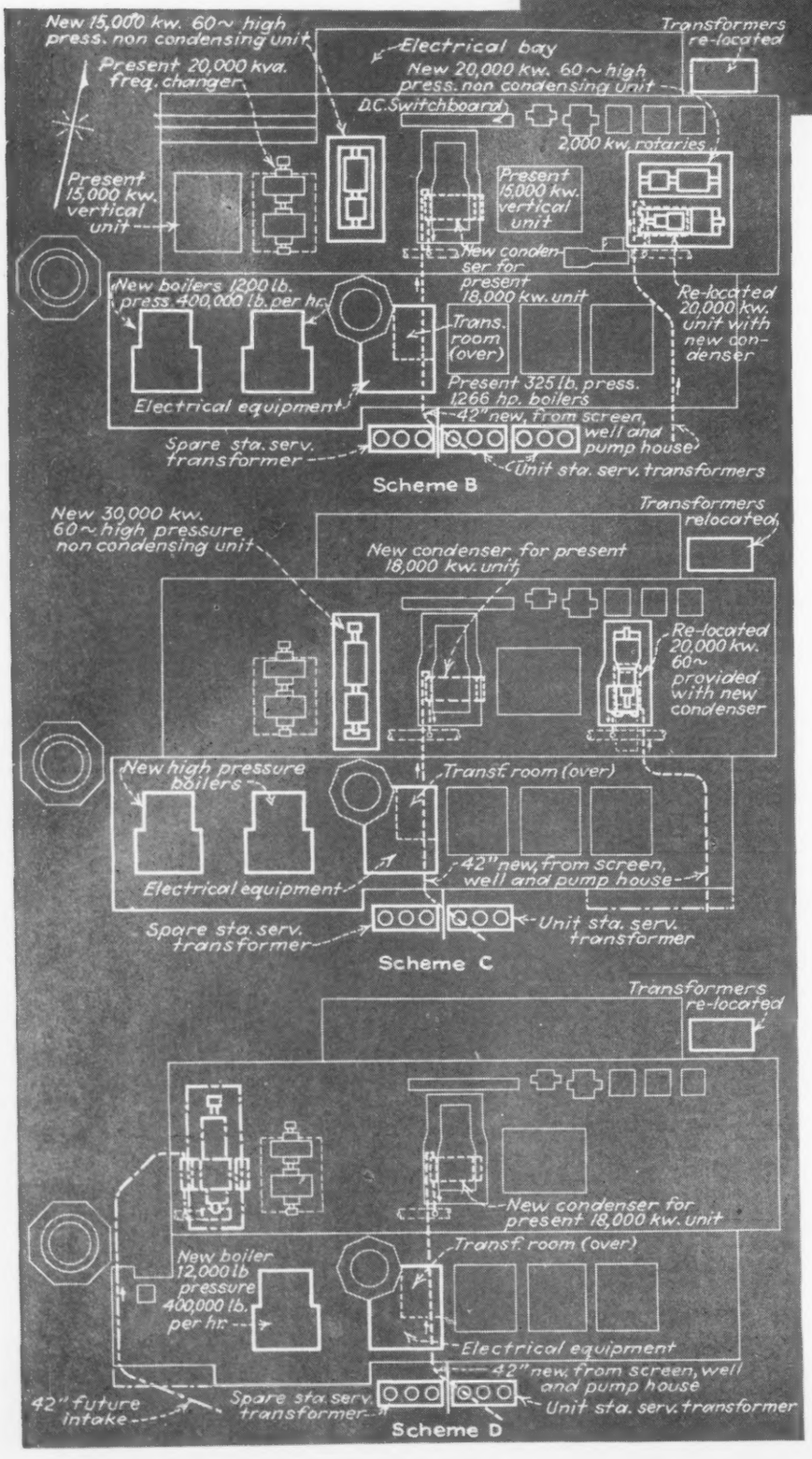


(C) This is a variation of plan (B). Put in a single 30,000-kw. top unit (1,200 lb.) at Manchester Street to exhaust at 200 lb. to both the condensing machines (the 20,000- and 18,000-kw. units). This would also involve remodeling the Manchester Street machine to operate at 200 lb. instead of 300 lb. and would require two new boilers, as in (B). Operating cost 89 per cent of plan (A).

(D) The adopted plan. Install a 40,000-kw. condensing machine with 1,200-lb., 3,600-r.p.m., 900-deg. turbine and 60-cycle generator at Manchester



Plan (A) for Manchester Street development


New 15,000 kw. 60~ high press. non condensing unit
Present 20,000 kva. freq. changer
Electrical bay
New 20,000 kw. 60~ high press. non condensing unit
Transformers re-located
D.C. Switchboard
2,000 kw. rotaries
Present 15,000 kw. vertical unit
New condenser for present 18,000 kw. unit
New boilers 1200 lb. press. 400,000 lb. per hr.
Trans. room (over)
Re-located 20,000 kw. unit with new condenser
Present 325 lb. press. 1266 hp. boilers
Electrical equipment
42" new, from screen, well and pump house
Spare sta. serv. transformer
Unit sta. serv. transformers
Scheme B
New 30,000 kw. 60~ high pressure non condensing unit
Transformers relocated
New condenser for present 18,000 kw. unit
Re-located 20,000 kw. 60~ provided with new condenser
New high pressure boilers
Transf. room (over)
Electrical equipment
42" new, from screen, well and pump house
Spare sta. serv. transformer
Unit sta. serv. transformer
Scheme C
Transformers re-located
New condenser for present 18,000 kw. unit
Transf. room (over)
New boiler 12,000 lb pressure 400,000 lb. per hr.
Electrical equipment
42" new, from screen, well and pump house
42" future intake
Spare sta. serv. transformer
Unit sta. serv. transformer
Scheme D

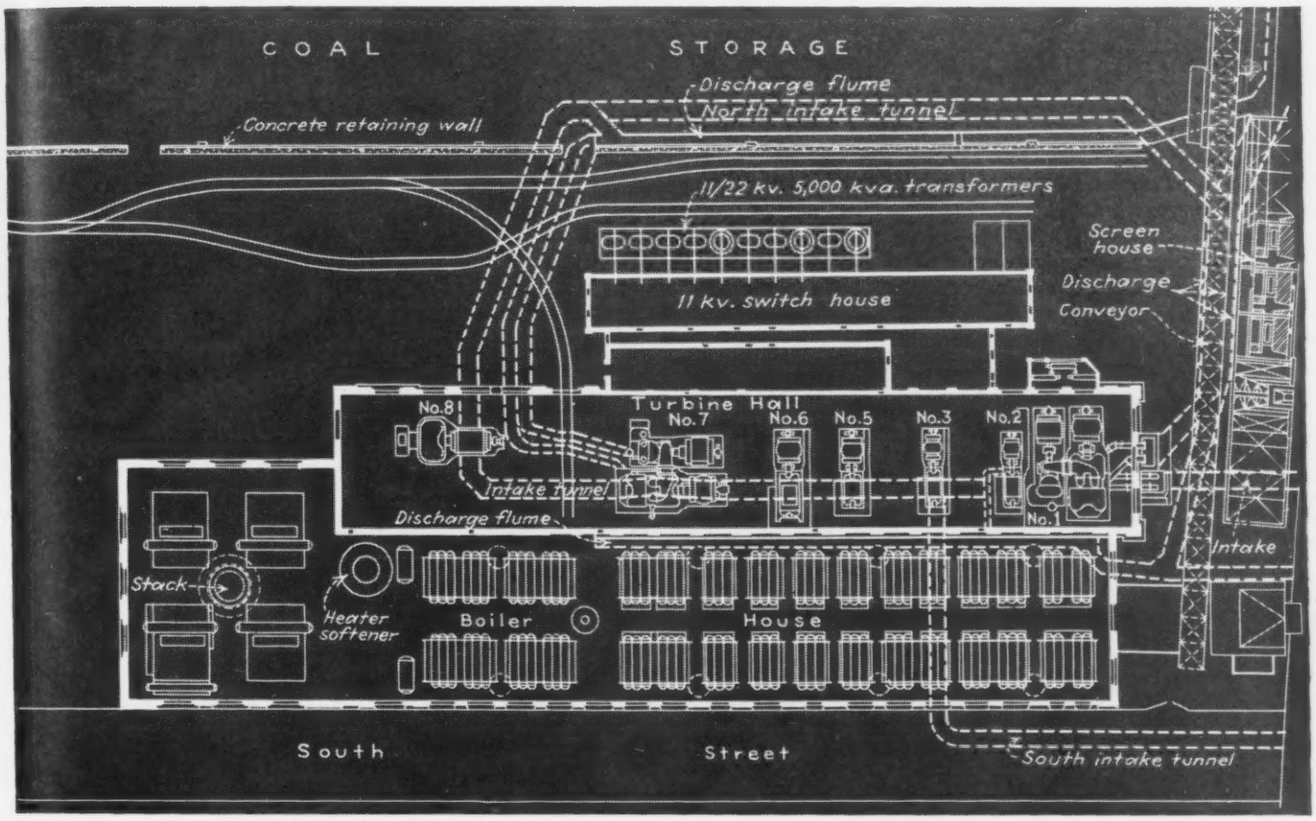
Plans (B), (C) and (D) for Manchester Street development

Street. This involves no transfer of generating capacity from South Street, the purchase of only one boiler, and enables the new unit when installed to be scheduled for base-load operation 8,000 hours per year. The operating cost is estimated at 96 per cent of plan (A). The new unit is to be of General Electric make, hydrogen cooled, and Combustion Engineering Corporation will furnish the boiler, the capacity being 430,000 lb. of steam per hour at 915 deg. Ingersoll-Rand will furnish the condenser, which will be of the single-pass, divided water-box, surface type instead of the jet type generally used in this locality because of poor water conditions. New alloys, traveling screen facilities and chlorination will be utilized to enable surface condensation to be employed.

A major factor in the decision to install a high-pressure condensing unit at Manchester Street was the increased reliability of operation associated with that program. In the last few years three or four very serious shutdowns have occurred in various cities of the East. Prior to this South Street station had had two complete shutdowns, and a division of responsibility between these two stations, fortunately so close together and to the load center of the Narragansett system, was considered valuable insurance of capacity. Under this program there will be no hazard to service at South Street during construction. No enforced outages of equipment will be required at South Street

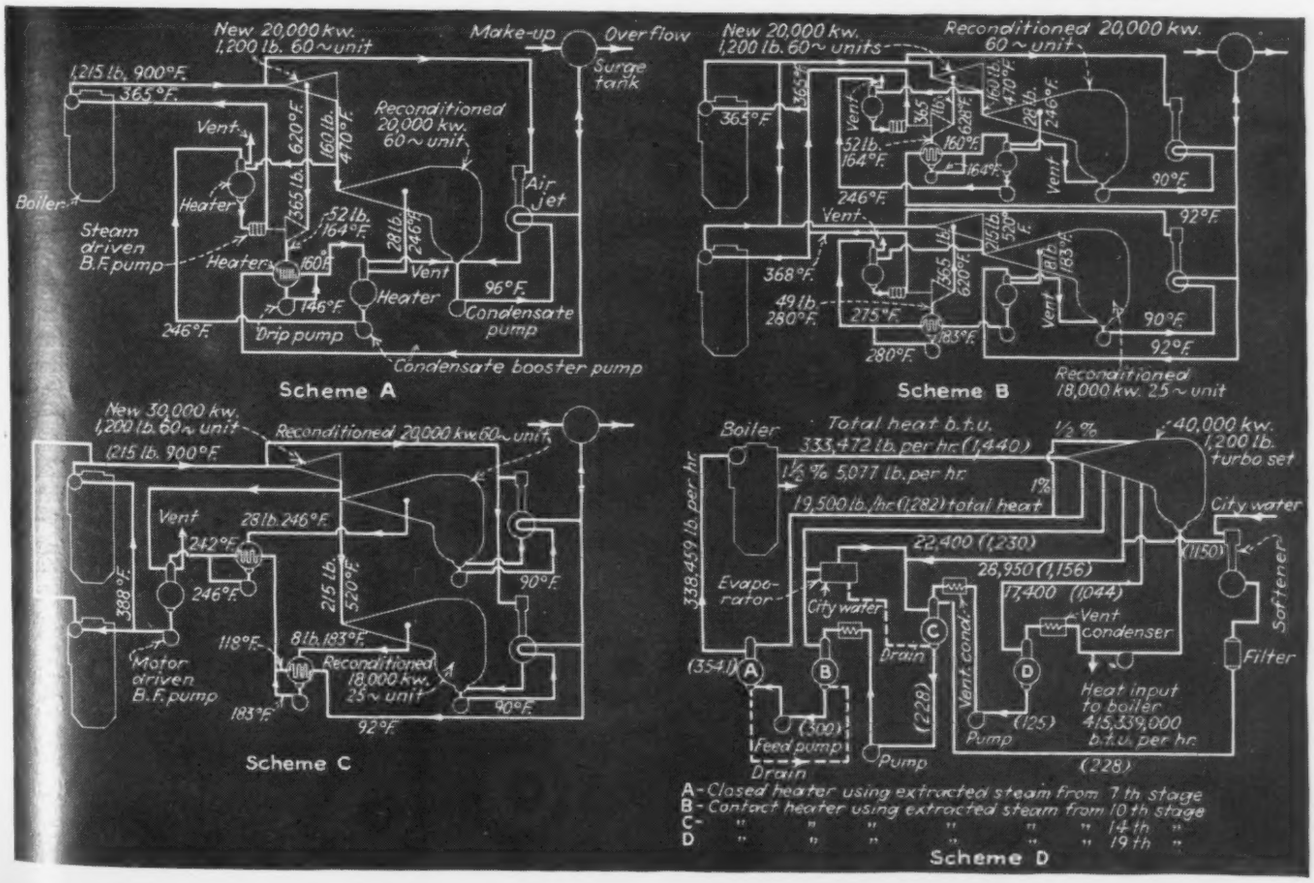
during the installation. Some advantages were inherent in a plan for a topping unit at South Street, but this was deferred on the basis that these advantages were insufficient to offset the value of building up two independent plants.

Four-point extraction for feed-water heating will be utilized in connection with the new 40,000-kw., high-pressure unit at Manchester Street. The new boiler will be designed for either pulverized coal or oil fuel, and will have a water-cooled furnace with provision for dry ash removal. It will be equipped



Plan of turbine hall and boiler room, South Street station

Flow diagram for Plans (A), (B), (C) and (D), Manchester Street development



with a steaming economizer, Ljungstrom air heaters and automatic superheat control. Eight 625-hp. boilers and a 200-lb. vertical turbo-alternator were junked at Manchester Street to provide suitable space for the new boiler and turbine installation.

The selection of the high-pressure condensing installation for Manchester Street was finally based on an analysis of the cost per kilowatt of the fixed charges remaining after crediting the benefits of the lower cost generation against the existing facilities. It is planned to produce 300,000,000 kw.-hr. per year from the new 40,000-kw. machine at Manchester Street, and the expected economy is approximately 12,000 B.t.u. per kilowatt-hour net production. The present production at South Street is at a rate of approximately 18,800 B.t.u. per kilowatt-hour; Manchester Street's figure is about 22,000 B.t.u., and the combined production at about 19,100 B.t.u. It is expected that the new unit at Manchester Street and associated boiler and auxiliary equipment (all auxiliaries are to be motor-driven except one standby boiler feed pump) will bring the combined operation of the two stations to an average rate of about 16,100 B.t.u.

Further plans

An important feature of the station development program at Providence is the so-called Franklin Square substation and R. I. system load dispatching headquarters, which have been established at this point on the Manchester Street station grounds and in close proximity to South Street. The switch house at South Street did not permit further economical development, and the dispatching headquarters were in rather limited space in that station. At the Franklin Square substation two 11-kv. buses have been provided with the well-known New England Power "1.5 circuit breakers per line" arrangement to insure high flexibility of operation. Sixty-cycle units, if installed at Manchester Street in the future, will be tied directly to these buses, which in turn will be connected with the South Street station buses. Distribution will be from both points. The arrangement contributes toward more reliable service on the local system.

Studies have been made covering the possibilities of strengthening the transmission tie facilities with the New England system in the interest of a firmer outside source in case of unexpected load increases or of major disaster.

Load Center Station Topped for Base Load

Schuylkill Capability Enhanced by Removal of Old Equipment, Reconstruction, Thermal Revamping, High-Pressure Superposition

CONDENSING WATER supply was one of the prominent factors involved in determining the type of capacity recently added to the Schuylkill station of the Philadelphia Electric Company after economic analysis proved this to be the most strategic location for capacity increase. Introduction of two high-pressure, high-temperature boilers and a turbine-generator, with their auxiliaries, most of which were installed in the space limits released by the removal of old equipment and building, presented other problems to be solved in rehabilitating this station.

Economy improved

The Pennsylvania-New Jersey interconnection, consisting of the Pennsylvania Power & Light Company, Public Service Electric & Gas Company and the Philadelphia Electric Company, has an aggregate capacity in excess of 2,000,000 kw. The location of Schuylkill station, in a very important load area of the Philadelphia Electric Company system, made capacity additions at this point most appropriate for increasing system reliability, without the necessity for additional transmission cable ties to this area.

First operated in 1903, this station at the time it was recently modernized had a capacity of 129,000 kw. and included three 215-lb. horizontal turbo-generators units (designated as Nos. 5, 8 and 9 in Fig. 1), totaling 85,000 kw., in addition to several older vertical units of various sizes. The station heat rate in 1936 prior to rehabilitation was nearly 32,000 B.t.u. per kilowatt-hour, load factor about 5 per cent, capacity factor 2.5 per cent. The best yearly heat rate of the section comprising the three horizontal units (Nos. 5, 8 and 9) and their boilers was 22,000 B.t.u. per kilowatt-hour. An analysis of the operation of units Nos. 5, 8 and 9 in conjunction with a new 50,000-kw., 1,250-lb. per sq.in., 900-deg. F. superposition unit and two new boilers revealed that performance of this section of the station could be improved to the point where the heat rate would be 11,800 B.t.u. per kilowatt-hour and shift Schuylkill station from standby to base-load operation.

Several factors influenced the decision to use superposition as the means of securing the desired added capacity. Existence of Nos. 5, 8 and 9 units, mentioned above, offered a favorable combination for adding capacity and increasing thermal efficiency through superposition. This form of expansion allowed maximum possible use of existing land, buildings and existing plant facilities, and the savings in labor, fuel and maintenance with superposition were proved to justify necessary investment in this type of unit. Use of a topping unit further provided the added capacity desired without demanding additional condensing water, which was not readily available due to the location of the plant on the Schuylkill River below a large dam and the use of water by the city from above the dam.

Superposed unit

The topping unit installed as a result of analysis of these factors was a 50,000-kw., 3,600-r.p.m. unit taking steam

at 1,250 lb. and 900 deg. F. total temperature and exhausting at 230 lb. into an existing steam header system.

It is a single-cylinder unit with one impulse element and fourteen reaction stages. The generator is a hydrogen-cooled unit rated at 50,000 kw., 85 per cent power factor, 13,800 volts. This unit was installed in the space previously occupied by an old 15,000-kw. vertical unit and is designated as No. 3 in Fig. 1.

Of 40 low-pressure boilers on two floors in boiler room No. 1, 24 were replaced by two 600,000-lb.-per-hour pulverized-fuel-fired steam-generating units of the bent-tube type, producing steam at 1,350 lb. and 910 deg. F. for the topping unit. The upper drum of these three units is provided with a steam washer. Three pulverized coal burners in each corner of the furnace are arranged for tangential firing. Twenty low-pressure generating units in boiler room No. 2 have not been changed except for conversion of ten stoker-fired units to oil firing.

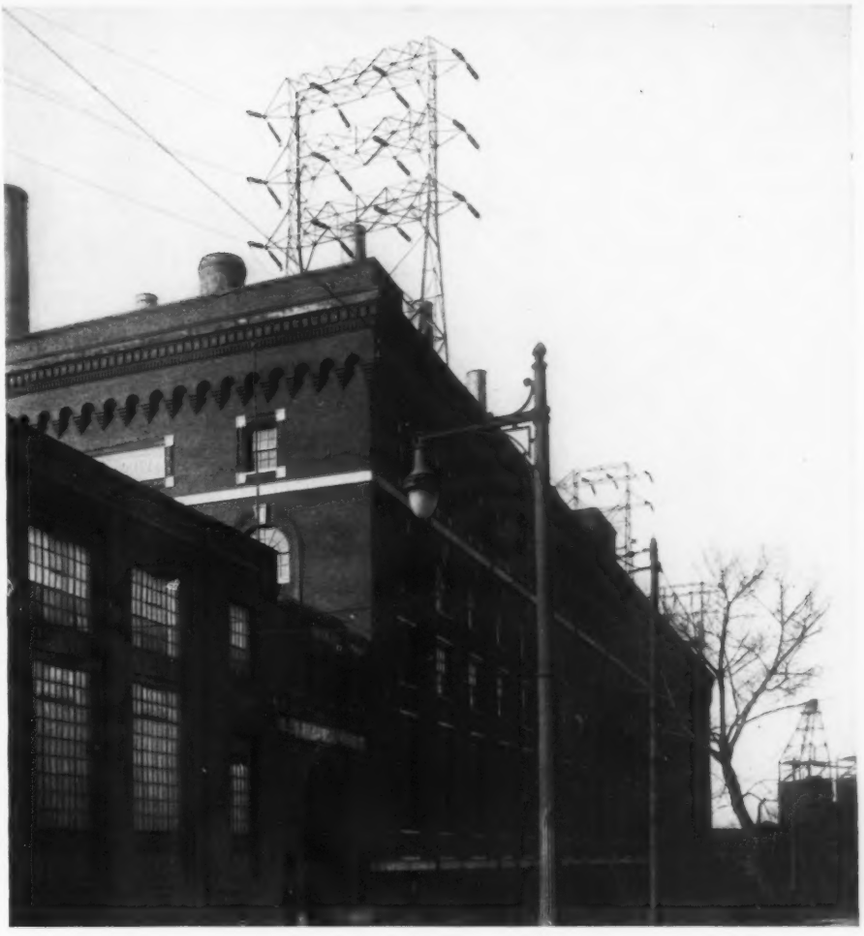
Physical adaptation dominant

While the topping unit does not of itself increase circulating water requirements, increased heat dissipation will accompany base-load operation of existing condensing units. No particular difficulty is anticipated in the near future from excessive circulating water temperature, in view of the fact that condensing capacity, in excess of that represented by the three units receiving steam from the high-pressure unit, had previously been operated satisfactorily. If at some later date, however, difficulty should be experienced due to low water level in the river below the dam, then increased circulation through condensers can be provided by the installation of booster pumps at the water intake. Circulating water as a factor in any future additional capacity in the station will depend on the experience gained in base-load operation of the present topping unit and the associated three condensing units.

The major problem of the project was the physical adaptation of the new equipment to the existing buildings and equipment and to such extensions as might be required by future capacity.

Turbine Room No. 2 was practically unchanged except for installation of two deaerating heaters, two first-stage heaters and three tank pumps, as shown on Fig. 2. No major structural change was required to house the equipment. Deaerators were installed on an existing gallery, at the turbine operating level, in space provided by the relocation of two existing surge tanks. Structural loads of the deaerator were distributed over the gallery by means of proper grillage. The first-stage feed-water heaters, shown adjacent to units Nos. 8 and 9 in Fig. 1, were located by providing an extension to the gallery adjacent to the units served. Entirely new framing, including columns and foundations, was installed, however, to isolate the heaters from the turbine platform proper. Tank pumps were installed in available space in the basement below the deaerators.

By far the bulk of the structural changes was made in boiler house No. 1, where 24 low-pressure boilers were replaced by the two high-pressure steam-generating units. The heavy loads of the new boiler installation made necessary the removal of practically all of the existing steel and walls in the space



THE SCHUYLKILL PLANT

Schuylkill station, in addition to being a distribution center for a large and important 60-cycle load, is the major 25-cycle power supply for the Philadelphia Rapid Transit Company's street railway system and is also a principal source of 25-cycle power supply to the Pennsylvania Railroad electrification. This plant was built in 1903 and enlarged in 1912.

During the years 1914 and 1915 the plant was extended and two steam turbo-generators of 35,000 and 30,000 kw. were installed. The later addition of a 20,000-kw. unit in the older building and certain station alterations left an available station capacity of 129,000 kw. Subsequent increases in system capacity were made at other locations.

When recent investigations indicated that additional capacity was required on the system, particularly in the Schuylkill area, these three turbines (originally designed for approximately 215 lb. per square inch gauge and 150 degrees F. superheat), offered an ideal condition for a superposed installation which would provide the needed increase in capacity and would place the obsolete station again in an efficient base-load class.

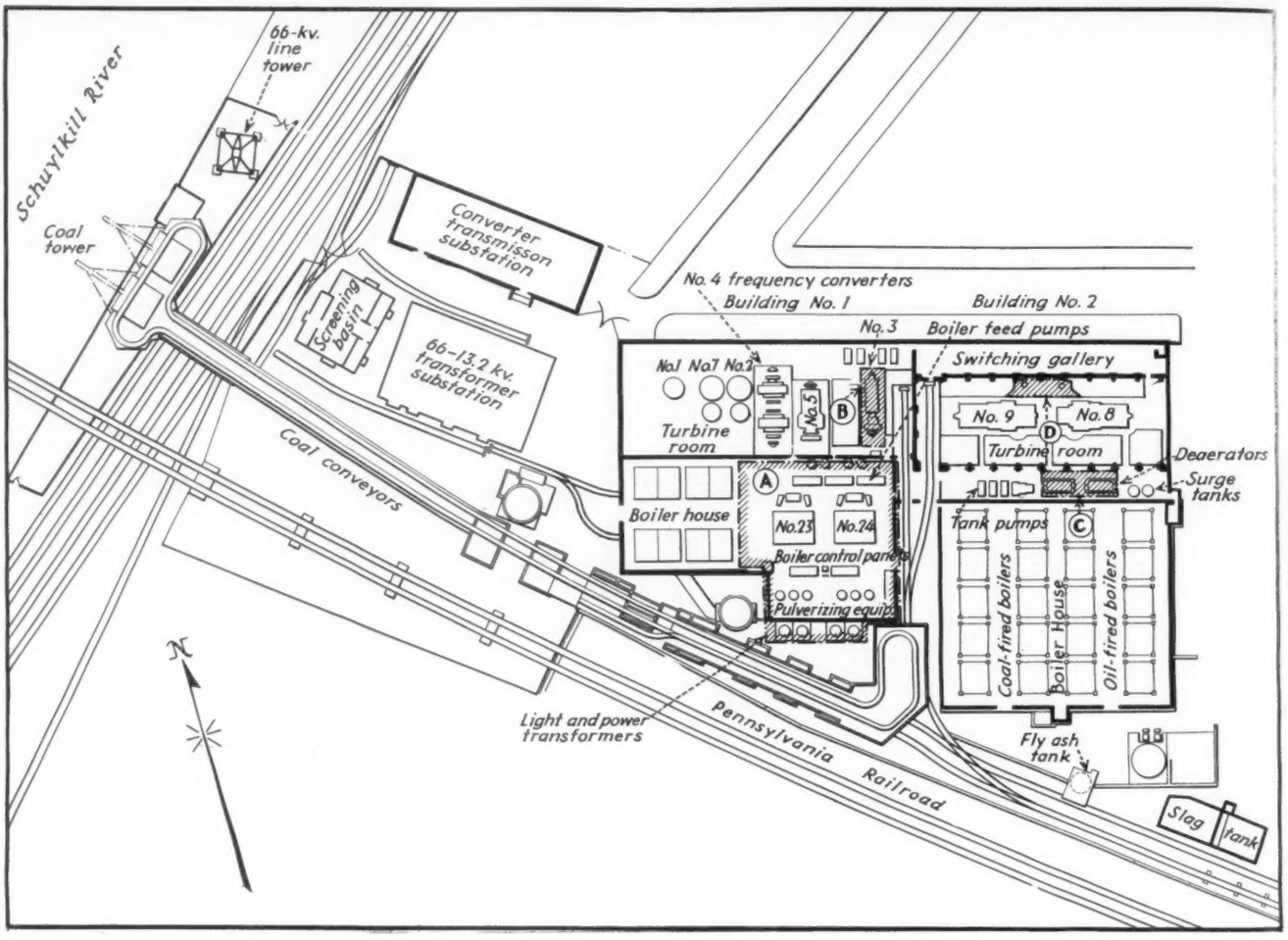


Fig. 1—Fifty megawatts replace fifteen at Schuylkill station

Area A—This area was cleared and reconstructed for the new installation.
Area B—Space made available for 50,000-kw. unit by removal of old 15,000-kw. unit.
Area C—A surge tank was relocated to provide space for deaerators.
Area D—Platform added to support first heaters.

affected, shown on Fig. 2. Moreover, the size of the boilers and the location of main supporting columns required the installation of almost a complete set of new footings. In addition to the area occupied by the original building (see Fig. 2) additional space was required to house a new coal bunker and the pulverizing equipment as well as to accommodate two new self-supporting steel stacks above this new area. The wall at the west end of this extension is of a temporary nature, permitting future extension if required. As a consequence of these structural changes the firing aisle of the remaining sixteen low-pressure boilers in boiler house No. 1 is on a somewhat higher level than that of the high-pressure units. Stairways were installed to provide adequate access between the two levels.

Stack dust control

Urban location of Schuylkill station largely led to the selection of electrical dust precipitation for the collection of fly ash from the boilers. These precipitators are located between the air heaters and the induced-draft fans. Each unit comprises three sections in width and two sections in depth. In addition, low gas velocities through ducts, breeching and stacks should preclude the possibility of dust nuisance in the plant area.

Deaerating heaters have been an integral part of the heat balance of the generating capacity added to the Philadelphia Electric Company system since about 1920. Not only is improvement made thereby in the operation, maintenance and life of boilers, piping, etc., by producing oxygen-free boiler water, but there is also an increase in the thermal efficiency of the station by using bleeder steam or auxiliary exhaust steam for feedwater heating.

Schuylkill station was originally equipped with open heaters, which accomplished somewhat the same results at a reduced efficiency. These open heaters receive their water directly from the hotwell pumps and exhaust steam from the turbine-driven condenser auxiliaries and boiler feed pumps. The old boiler feed pumps take their suction from the open heaters and feed directly into the old boilers. Duplex-driven circulating pumps having motor and turbine on one shaft are utilized in both old and new arrangements for heat balance purposes.

Heat balance

For the new section the heat balance was to some extent dictated by existing facilities. Two of the three low-pressure turbines operating with the topping unit could be conveniently arranged for bleeding. The third could not be economically equipped for bleeding. The first-stage heaters will therefore heat condensate from the two units to about 150 deg. F., while condensate from the third unit will be sent directly to the deaerator feed line at hotwell temperature. Steam from the various station auxiliaries is utilized in deaerating heaters at about 3 lb. per sq.in. gage pressure for deaerating and heating boiler feed water.

As shown in the heat balance diagram (Fig. 3) boiler feedwater for the new section was taken from the d

aerator and pumped successively through evaporator condensers, second heaters and third heaters to the suction of the boiler feed pumps. Three tank pumps and three boiler feed pumps were installed, two of each being sufficient to supply water for full load in this section of the station. These pumps are powered by steam turbines driven by 230-lb. steam exhausted from the topping unit. These auxiliaries, together with the condensate and air pumps in units 8 and 9, exhaust at approximately 5 lb. per sq.in. gage pressure to general exhaust headers feeding the deaerators. Evaporators and second heaters receive their steam at approximately 75 lb. per sq.in. gage pressure from a bleed point on the boiler feed pump turbine. The third heaters receive their steam at 230 lb. per sq.in. gage pressure on exhaust of the topping unit.

Due to the possibility of fluctuation in pressure, excessive pressure drop across the turbine stage, with resulting instability of bleeder steam flow from two units discharging to a common heater, it was necessary to separate the first heaters. Independent heaters being provided, one for No. 8 unit and one for No. 9 unit, it was deemed wise to continue this plan to double heaters throughout, thereby eliminating bypasses, with their attendant valves, and permitting the operation of the plant through one line of heaters in case of emergency. The installation of heaters before the high-pressure boiler feed pumps makes possible the use of lower pressure and consequently lower cost heaters, which contribute to the economic justification of the double arrangement.

Preliminary operation of the high-pressure boilers to date has not disclosed any problem other than those of minor importance attaching to preliminary operation of a new system.

Fig. 2—Boiler house practically rebuilt for installation of new steam generator

Area A—This area was cleared and reconstructed as to footings, steel work and walls. Area B—15,000-kw. vertical turbo-generator replaced by 50,000-kw. topping unit.

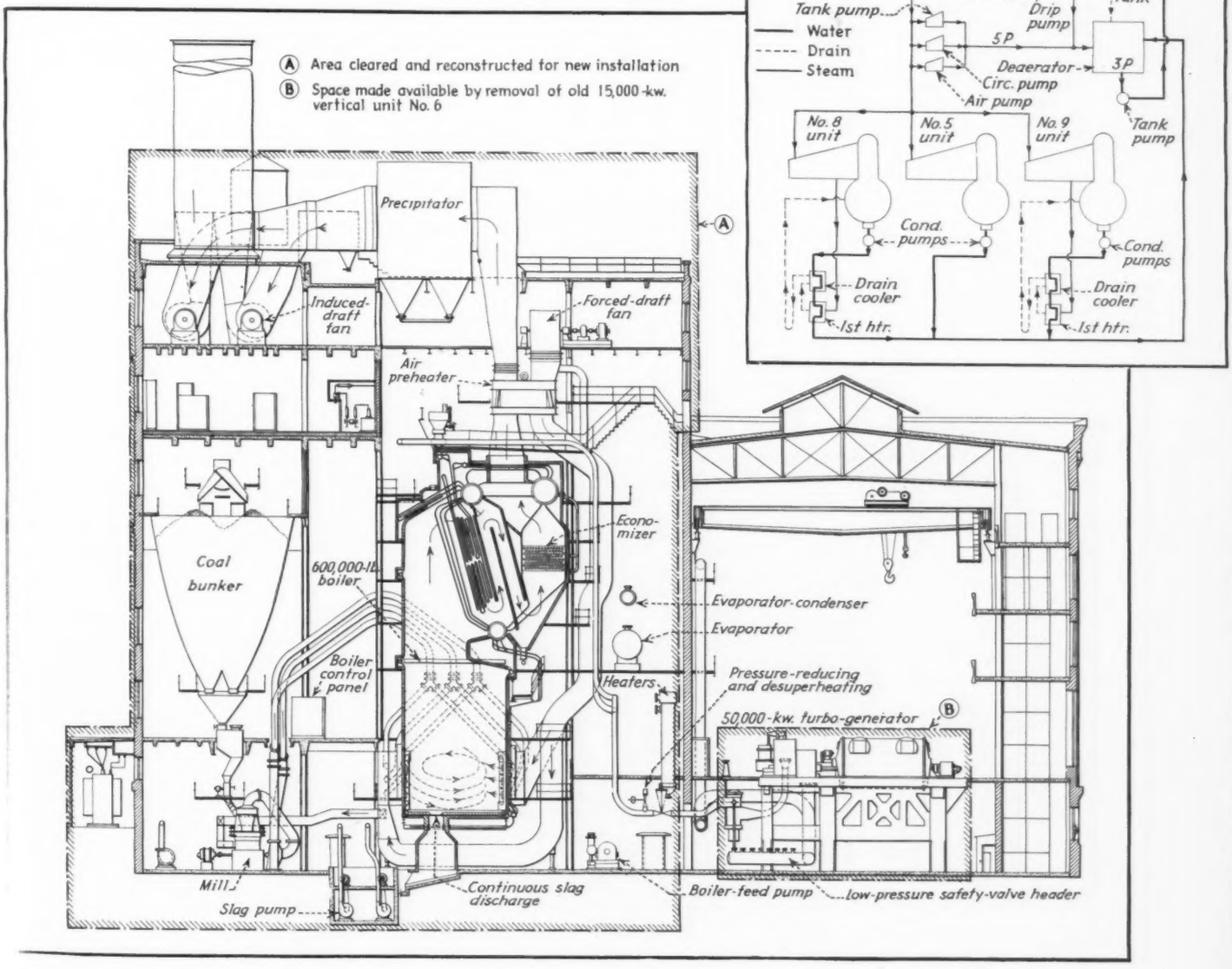
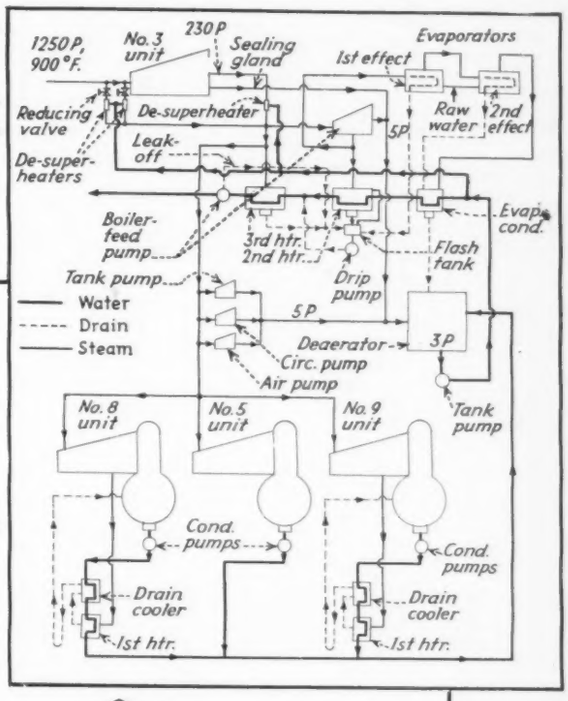


Fig. 3—Heat balance for revamped station

The turbine drives are—
1. Boiler feed pumps (230 lb.).
2. Tank pumps.
3. Circulating pumps (dual drive).
4. Air pumps.

P = pounds per square inch gage.



The Rebirth of Fisk Station

Installation of Topping Turbine Starts Historical Plant on New Career as Base Load Station—Located Practically at Load Center, Fisk Gives Opportunity For Fullest Realization of Modern Developments in the Power Plant Art

By HARRY B. GEAR
Vice-President
Commonwealth Edison Company
Chicago

FISK STATION of the Commonwealth Edison Company may be taken as the exemplar of progress in the art of electricity production by steam power. This is not to claim for Fisk constant pre-eminence in efficiency and modern design, although it did hold the outstanding position in those regards at the beginning of the steam turbine era. Rather it is to say that in Fisk station may be found today, as has been the case almost throughout its history, the current expression of the existing state of the art. The story of Fisk is the story of the development of steam turbine power production.

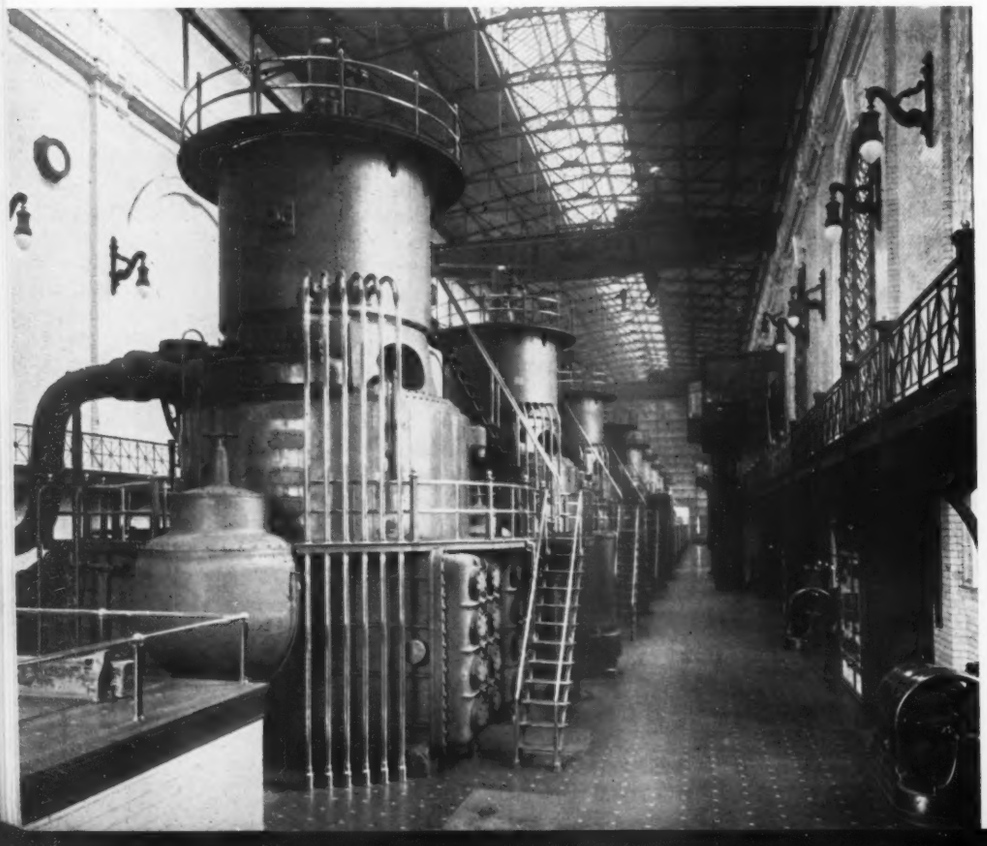
Originally planned to have fourteen 5,000-kw. vertical turbines, Fisk was never finished in that design, nor has it ever been finished in any other later plan because always there was something new ahead. Only three of the 5,000-kw. units were installed, the fourth was 7,500 kw. Then 8,000-kw. units of no greater space requirements became available and six were put in. These were soon rated up to 12,000 kw. and the three 5,000- and one 7,500-kw. machines were replaced by the later type.

Before the remaining four units of the original plan were installed the problems of the horizontal turbine of higher rating were solved and the station was finally filled out with four of these in sizes ranging from 20,000 to 35,000 kw. The plant planned for 70,000 kw. had become one of 230,000 kw. For a considerable period in the decade of the '20s it looked as though Fisk had reached the end of its story. Adjudication of the Chicago water diversion controversy, setting 1,500 second-feet as the maximum flow to be diverted from Lake Michigan into the Chicago River, apparently set a definite limit on the capacity of Fisk as on the other Commonwealth Edison plants that took the condensing water from the river.

It was during this time that attention was turned to sites outside the city and the Waukegan, Powerton and State Line plants were built. Then came the great forward step into higher steam temperatures and pressures and the consequent greatly increased electricity production capacity associated with a given volume of condensing water. As it bears the honor of being the first major steam turbine power station in the world, Fisk has also the lesser distinction of being the first station in Chicago in which a high-temperature, high-pressure topping turbine is installed. And the plant which was designed at the turn of the century to house 70,000 kw. of generating capacity now finds itself in the way of development to possibly seven times the capacity contemplated in the original plan.

Topping turbine decided

The latest addition to Fisk, now in regular operation, is a 30,000-kw. topping turbine that takes steam at 1,200 lb., 900 deg. F., which is discharged at 220 lb., 530 deg. F., and is joined by the exhaust from three high-pressure boiler feed pumps also at 220 lb., but 650 deg. F., which gives a temperature of 550 deg. F. to the combined exhaust. Two older turbines, one of 25,000 and one of 35,000 kw., are normally operated with this exhaust, but it may be diverted to others if desired. The topping turbine and its two associated low-pressure units drive generators for the 25-cycle system which carries a considerable proportion of the Chicago load. It was anticipated that the operating unit of 90,000 kw. thus obtained would show an economy of around 12,150 B.t.u. per kilowatt-hour and this figure is being approached. Indicative in this direction is the comparison of station operating performance before and after



The original appearance—This picture, taken about a quarter century ago, shows the modern power station of its day

the new unit went into operation. In a 1937 month the total station output was 26,000,000 kw.-hr. with an economy of about 21,000 B.t.u. per kilowatt-hour. In the same month in 1938 the total output was 49,000,000 kw.-hr. and the economy between 13,000 and 14,000 B.t.u. per kilowatt-hour for the whole station, which includes operation of some of the low-pressure boilers.

Double gain derived

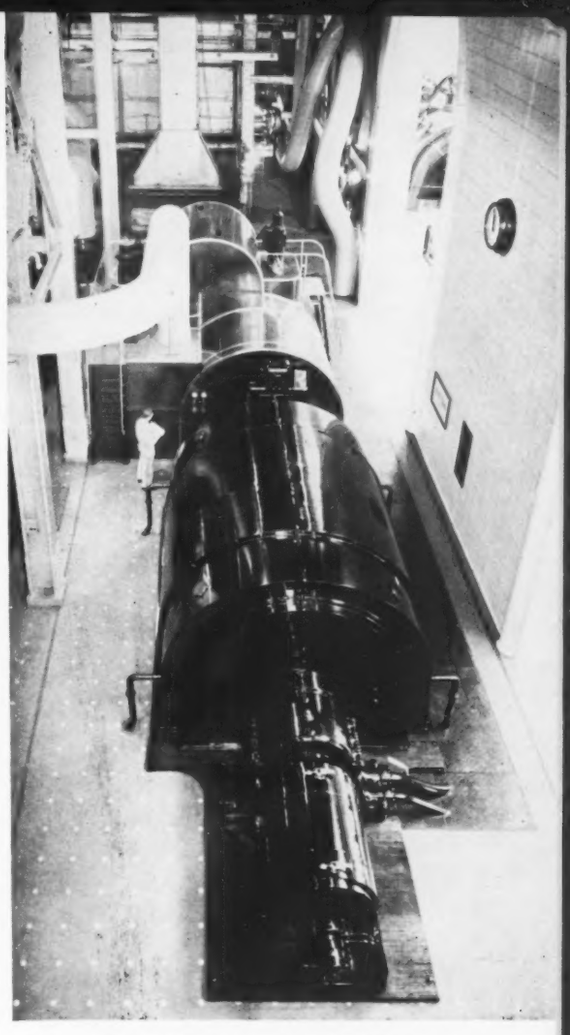
But improvement in production efficiency, gratifying as it is, was not the only reason for installing additional capacity at Fisk any more than it has been the reason for new plants or capacity additions anywhere. Load growth was the more important factor and it is in this respect that ability to enlarge the station has greatest value. Fisk station is located in practically the center of Chicago, not more than 3 miles from the Loop, which is the area of greatest load density. During the period when generation expansion was outside the city the Fisk location had been built up to a very considerable importance as a bulk power center in the 66-kv. system fabric that covers Chicago. Therefore the topping turbine, making no increased demand for condensing water, restored major generating station value to a site that had become preponderantly a distribution center for energy generated elsewhere.

The load on the 25-cycle system in Chicago arises in part from direct-current service to the downtown area and in part from metropolitan transportation. Barring the possibility of changes in traction energy supply, there is little chance of reduction in this particular portion of the direct-current load. However, general direct-current service to the business area can be reduced by cutting over parts of this load to the growing 60-cycle alternating current network, although at present this work is doing hardly more than to prevent significant increase of the existing direct-current load.

Thus there is little immediate probability of decrease in the burden on the 25-cycle system; it probably will not grow larger, but it will not decrease, not in the immediately foreseeable future. The greater part of the 25-cycle generation is concentrated at Fisk station and its bulk distribution as well. In order to provide a tie between the 25- and 60-cycle systems and also to allow economical loading of the newer and more efficient generating units in the 60-cycle system there are at Fisk two 40,000-kva. frequency changers.

The new installation at Fisk thus does much more than improve the efficiency of 25-cycle generation and release 60-cycle capacity for load growth on that system. It also reduces the losses in changing from 60- to 25-cycle current and in transmission of that energy from distant points of generation to the frequency changers. And in anticipation of the possibility that the topping unit may some time be needed in the 60-cycle system, the new turbine is so designed that its speed may be raised from 1,500 to 1,800 r.p.m. and it may be used to drive a 60-cycle generator. Thus full advantage of the immediate and potential values of the new unit has been realized.

Most readily apparent and therefore most striking virtue of modern practice in use of high-temperature and high-pressure steam illustrated at Fisk is economy of space. In the floor area formerly occupied by sixteen small boilers and whose total energy output in the original design would have amounted to only 10,000 kw. is installed the entire assembly of high-pressure equipment—two boilers, each capable of maximum outputs of 412,500 lb. of steam per hour; the 30,000-kw. turbo-generator, three high-pressure boiler feed pumps, four coal scales, four pulverizer exhausters, two dust collectors, two induced-draft fans and two forced-draft fans. Two large arched openings have been cut in the wall between boiler and turbine rooms, giving the station a start toward the modern idea of no structural division between boiler and turbine spaces.

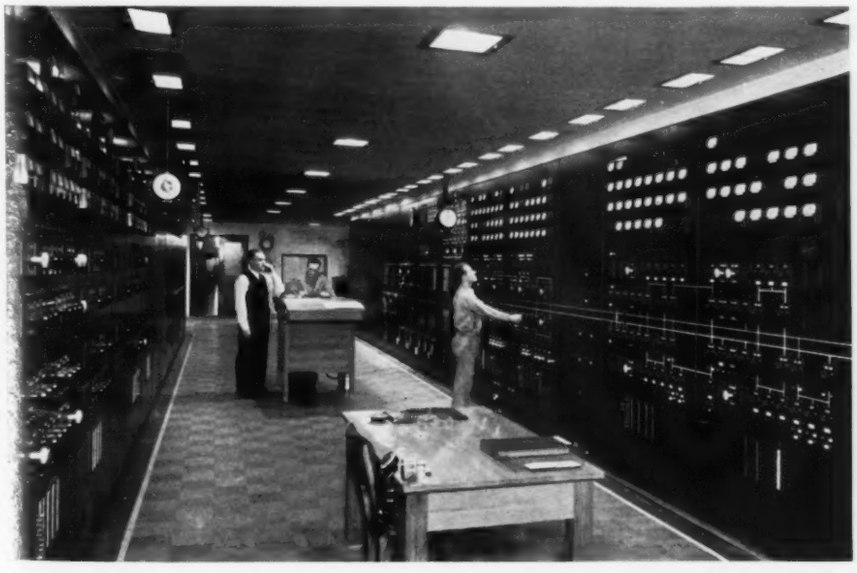


Fisk today—Here is the 30,000-kw. topping turbine installed in the boiler room

The recent capacity addition has required no enlargement of the station building except upward. It was necessary to raise the roof over the new boilers because of their greater height. The successive enlargements of the station from its original 70,000-kw. design have been accomplished within the original four walls. And expansion to the ultimate capacity of 500,000 kw., which is the way the picture looks at present, will probably be within the same four walls. The only physical enlargement of the station that will be required will be the necessarily greater coal handling and storage area.

Not least important in the revision of an older station by the installation of modern topping or other high-pressure

New central control gallery at Fisk station



better efficiency and operation. The desirability of such changes may have been apparent for a long time, but unless they can be included in a major station revision they are hardly justified. They may then be made at minimum cost. Two major opportunities for improvement were taken during the installation of the topping unit at Fisk station. The auxiliaries of the two existing turbines taking exhaust from the topping unit were modernized. Modern steam jet vacuum pumps and motor-driven hotwell pumps replaced the old hydraulic pumps and turbine-driven hotwell pumps. New evaporators and closed heaters were installed with extraction connections from two stages of each turbine.

These changes make important contributions to the improved economy. Another improvement made during the topping unit installation was the bringing together of complete station control into one center. In the original design two operating galleries had been provided, each for control of seven units and their associated switching equipment. At the time of the installation of the two 40,000-kw. frequency changers it became necessary to install a third control gallery in the frequency-changer house for their control and for the initial installation of the 66-kv. transformer terminal. This was the solution of the problem at that time.

But with the envisionment of Fisk as a station in the half-million-kilowatt class, it was realized that control should be centralized and that now was the time to do the job. This was done sufficiently in advance of installation of the topping unit to permit its control equipment to be installed permanently in the new central location.

No great amount of new construction nor revision of existing structures was necessary in fitting the new unit into the electrical system. Existing switch and bus positions were available and were used. Although the new generator is in the 25-cycle system, energy for the topping turbine auxiliaries is at 60 cycles, 2,300 volts. This was done for obvious reasons of first cost and also in anticipation of the time when all auxiliaries in the station will be driven by energy of the higher frequency.

Thus it is to be seen that modern developments in the power plant art have restored first-rank-system responsibility to a station that was approaching the status of a standby plant. It is not probable that Fisk ever would have been ranged in the ranks of desuetude with Quarry, Harrison and other plants of the Chicago system whose day is past. But if the recent great advances into the realms of higher steam temperatures and pressures had not come about, Fisk undoubtedly would have been relegated to a position in the second line of production economy as a peak-load or a standby station until complete rebuilding was justified. Now Fisk is reborn and is well on the way toward a second term as an important base-load station close to the load it serves.

Modern Station Design Employs New With Old

Progress in Power Plant Art Not Confined Simply to Raising of Steam Pressure and Temperature—Plant Buildings Modified With Resultant Lower Cost as Improvements in Equipment and Apparatus Are Made

By **BERNHARD SCHROEDER**
President
Sargent & Lundy, Inc.

ALTHOUGH the number of generating capacity additions to electric utility systems has been rather few in recent years, the time of engineers concerned with design of plant equipments and plant structures has been well employed in the development of new ideas and in the integration of inventions, research accomplishments, experimental results and new materials into the practical terms of power station construction. The fruits of this work are now beginning to appear as the growing need for additional generating capacity takes on an imperative aspect in many cases and new plants and enlargements of old ones result therefrom.

Conspicuous economies in both operation and investment are being obtained by the incorporation into power plant design of these developments in higher pressures and temperatures of steam. But, as always, good design does not wholly abandon the old when it takes up the new, and there are many instances in which lower pressures and temperatures produce greater combined economy of operation and investment. The point is that these recent developments should be regarded as enlarging the art of electricity production by steam power, rather than as revolutionizing it.

Also, progress in the art has been made in directions other than only the raising of steam pressures and temperatures to higher levels. We have seen in recent years a definite trend toward a simplification and minimization of the structures that house power production equipment. The so-called "outdoor" plants are the more conspicuous examples of this trend, but it may also be seen in others of more conventional exterior. With the displacement of the old boiler by the modern steam generator, cleaner, more efficient and more an assembly of machines than simply a Gargantuan tea kettle, the desirability of a dividing wall between boiler and turbine rooms is disappearing.

An early example of this is found in the plant of the Wisconsin Power & Light Company at Sheboygan, Wis. The same idea appears in the Woodcock plant of the Central Ohio Light & Power Company at Bluffton, Ohio, of which a plan and section are shown in accompanying illustrations. In the Woodcock design appears also a later development toward structural simplicity. This is the putting of all plant operating functions on one floor level, above which rise the turbo-generator mountings with the condensers and generator air coolers inclosed in them. The

floor of what in another station would be the turbine room is hardly more than a catwalk around the units. In fact, the building is simply a rectangular shell with no interior walls whatever.

Boiler make-up

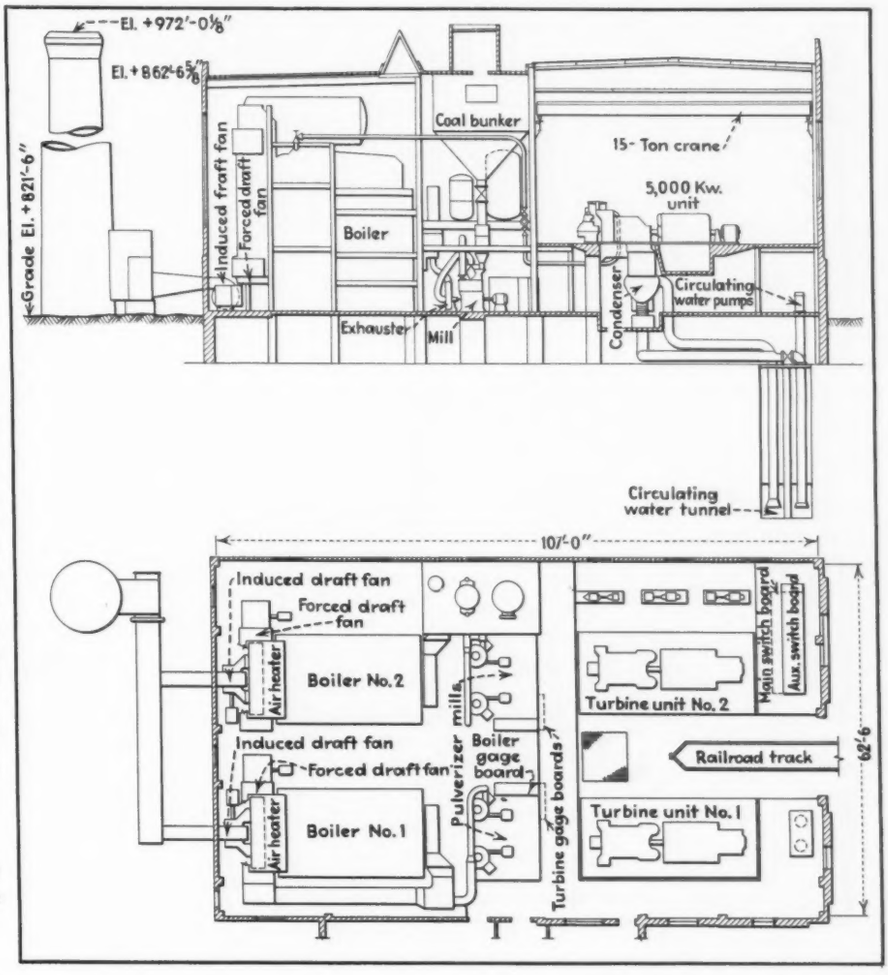
Another advance in power plant practice which in some instances allows capacity addition at comparatively low cost is the improvement in recent years in the treatment of boiler make-up water. A case in point is that of the Tulsa station* of the Public Service Company of Oklahoma. When this station was built, in 1919, water supply for the boilers was a troublesome problem. The only way to cope with the characteristics of the local water supply was to provide a sufficient excess of boiler capacity so that boilers could be taken out of service for the frequent cleanings that were necessary.

This existing overcapacity in boilers stood ready for use when better means of make-up water treatment became available and growing load required the provision of additional generation. Also, the station, burning natural gas in a region where it abounds, has a very low fuel cost and thermal efficiency is a matter of much less moment than plant investment. For these reasons the addition to generating capacity, a 20,000-kw. turbo-generator, was made at the existing steam pressure of 225 lb. and temperature of 600 deg. F.

As it stands now, the station is ready for its next capacity addition, which, presumably, will be a topping unit, since the supply of condensing water is rather limited. Another installation of this kind is the 15,000-kw. unit being installed in the Arsenal Hill power station of the Southwestern Gas & Electric Company at Shreveport, La., the steam pressure here being 257 lb. and the temperature 670 deg. F.

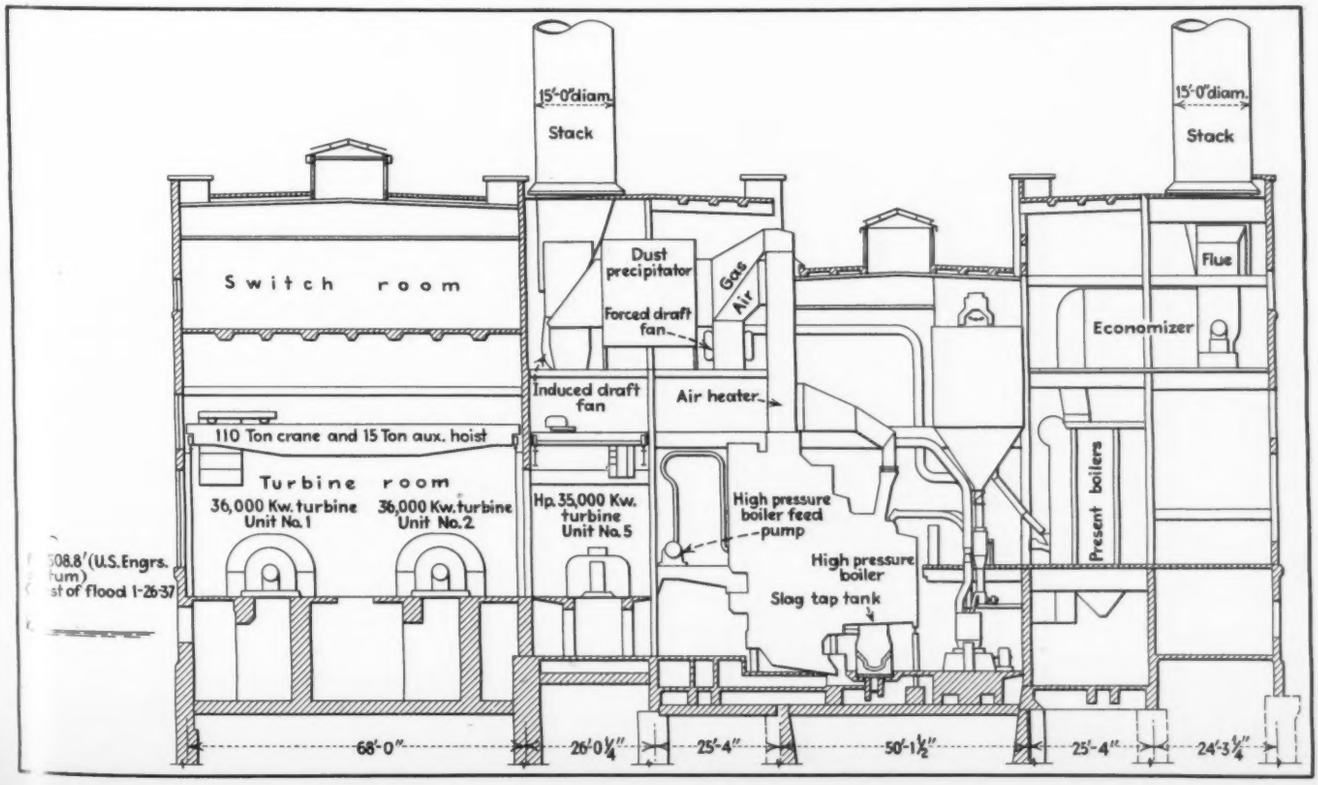
The general idea of the principal merit of the superposed or topping turbine is the improvement it makes in thermal efficiency in a station contain-

* To be detailed in a forthcoming issue of ELECTRICAL WORLD.



Plan and section of Woodcock station

Section West End station



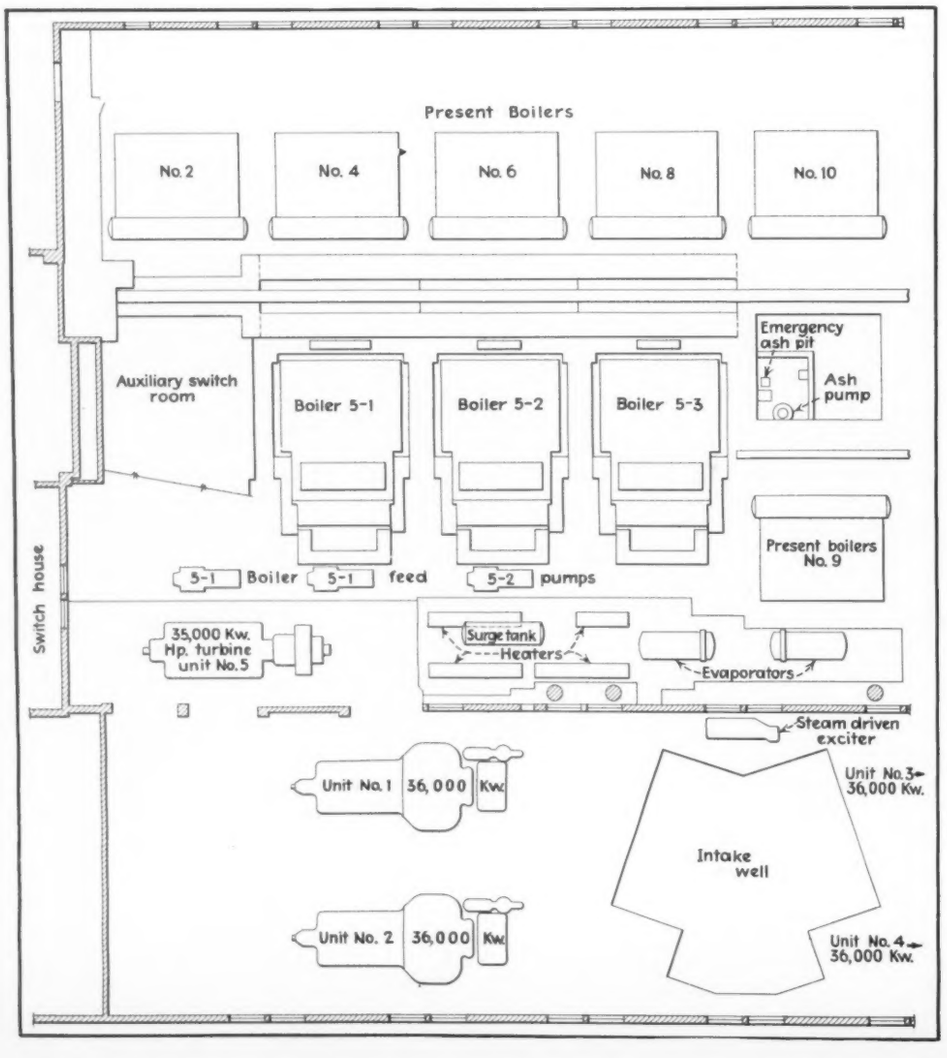
ing older, low-pressure machines. Reductions in heat rate from ranges of 21,000 to 22,000 B.t.u. per kilowatt-hour to levels of 12,500 B.t.u. and below are frequently cited. But this improvement in economy does not state the whole value of the topping turbine. Another factor, which may be even more important, comes into the picture. This is the factor of geographical location of the station in which the unit is installed. Usually the station is an older one, close in to the load center, where new capacity will require the minimum provision of transmission facilities.

An outstanding example of this value of the topping unit is afforded by the Fisk station of the Commonwealth Edison Company, which is the subject of an article by H. B. Gear in this issue of ELECTRICAL WORLD. A case quite comparable to Fisk is that of the West End station of the Cincinnati Gas & Electric Company. The superposed installation of a 35,000-kw. unit in this station presented some interesting problems for solution.

The station contained four 36,000-kw. turbo-generators operating with steam at 250 lb. and 600 deg. F. supplied from fourteen stoker and gas-fired boilers. The station is built on the bank of the Ohio River and is supported on caissons about 90 ft. deep. Because of the type of foundation it was desirable that the new equipment be set upon the existing bearings and that the minimum of revision be made in the building structure. Plan and cross-section of the station appear in accompanying illustrations. From these it may be noted that the new steam generators are fitted into the existing column spacings. The steam generators had to be somewhat special in design in order thus to fit into the building structure and to avoid any changes in the foundation caissons and in the principal steel framing of the building.

Removal of four of the old boilers provided ample space for the topping turbine and for three steam generators, each good for 300,000 lb. per hour of steam at 1,250 lb. pressure and 910 deg. F. temperature. The load on the station would not permit of the removal of the four old boilers at one time. Two were taken out as the initial step. This provided space for one high-pressure steam generator and for the topping turbine. This first steam generator was put into service to supply steam to the low-pressure header through a desuperheater and pressure-reducing valve, while the third and fourth of the old boilers were being demolished and removed. The three steam generators were completed somewhat ahead of the new turbine and their outputs were taken into the low-pressure system through the heat and pressure reduction equipment which will be utilized in future station operation when the topping unit is taken out of service for maintenance or other reasons.

Plan West End station



Coaling facilities

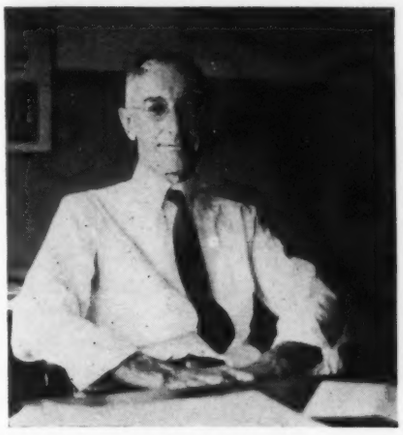
As in Fisk station in Chicago, where installation of the topping turbine provided opportunity for improvement of other aspects at minimum cost while the new construction was in progress, the addition of high pressure capacity at West End made occasion for entirely changing the system for coaling the station. A system of belt conveyors and inclosed overhead bunkers now replaces the former use of receiving hoppers in the basement, small overhead bunkers and traveling unloading crane. One of the former coalpits is used as an ashpit, to which the slag from furnaces and flue dust from precipitators are carried by a "Hydrojet" conveyor and from which they are removed and loaded on cars by the old coal-handling crane.

The instances recited here, while fully recognizing the inherent and associated advantages of recent progress in the employment of steam at higher pressures and temperatures, also show clearly that economy is still to be found in older practises. For fairly small, all new plants, like Woodcock, with steam conditions of 450 lb., 825 deg. F., the medium ranges of pressure and temperature will likely prove best for some time to come. And in existing plants, like Arsenal Hill and Tulsa, where space provision is not a troublesome factor, where fuel cost is now, simple additions at existing plant steam conditions may frequently show the smallest total of fixed and operating charges. However, when new plants are built for lower steam pressures and temperatures or plant additions are made at existing steam conditions it will frequently be economical to include provisions for later adaptation to higher pressures when new capacity is needed. All of which is to say that the newer and the older are not separable, but together constitute the power plant art of today.

In order to keep up with the rate of progress of recent years, it is necessary that the later things and methods be tried out in practise as the new materials, ideas and conditions they represent are developed and crystallized. Therefore reasonable expenditures on the new and novel must continually be made in order that the benefits of progress may be reaped as soon as possible.

Strobo-Meter for Efficient Meter Testing

By A. G. TURNBULL
Superintendent Testing Division, Meter Department, Commonwealth Edison Company, Chicago



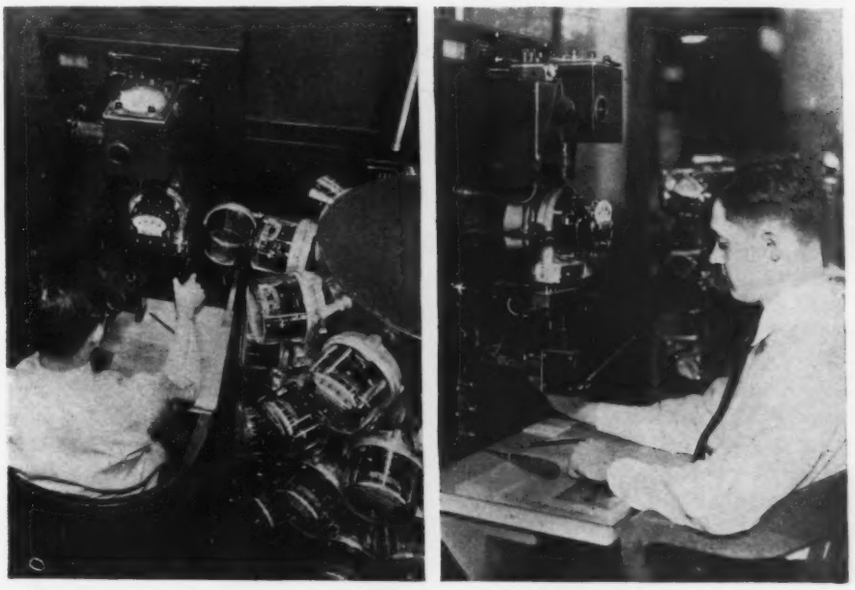
A. G. Turnbull

WHEN testing new watt-hour meters, which ordinarily require a minimum of adjustments, a meter tester can turn out 120 small capacity alternating-current meters per eight-hour day on the strobo-meter that has been in use several months in the testing division, meter department, of the Commonwealth Edison Company. The strobo-meter can be used only on meters that have disks with milled edges and is, therefore, limited in use to checking meters of fairly recent manufacture. Older meters, with smooth edge disks, must be checked by the usual revolution counting methods. The strobo-meter is used for making the usual checks at light, heavy and inductive load on single-phase meters.

In operation, a beam of light is directed vertically downward across the edge of the disk of a standard meter. In line below, so that its disk edge also cuts the light beam, is the meter under test. By means of a magnifying and reflecting optical system a stroboscopic image of the milled projections, resulting from the comparative rotational speeds of the two disks, appears on a ground glass. If the two speeds are equal—that is, if the accuracy of the meter under test is 100 per cent—the image is stationary. Drift of the image forward or backward shows that the meter is fast or slow and the speed of drift is an indication of the magnitude of error. The error, in per cent, is read from the dial of a rheostat, which is adjusted either way from the center point of 100 per cent to bring the speed of the standard into agreement with that of the meter under test.

Several changes from the form in which it was received from the maker have been made in the strobo-meter now in use in Chicago. No socket type meters are being used by the Commonwealth Edison Company at the present time, and removal from the strobo-meter of provisions for testing this type of meter has considerably simplified the device. As delivered, it was equipped with a removable plate, mounted in front of a socket meter receptacle, on which ordinary bottom connection meters were hung for test. The effect of this arrangement was that the meters being tested projected out a considerable distance from the face of the board. This put the disk of the meter under test out of vertical line with the disk of the standard and it was necessary to use a movable arm on which is mounted a prism system—this arm is part of the original equipment of the checker—to bring the light beam into interception by the disk of the meter being tested. By removing the socket meter receptacle it was possible to bring the meter under test directly below the standard. This allowed the light beam to be moved to the front from its original position where it was directed on the disk at the left side of the

[*Continued on page* 111]



The strobo-meter in use

These two views show the elements of the strobo-meter and their arrangement. To the left of the rotating standard at the top of the board is the box containing the light source. In both views the operator's right hand is on the rheostat control, by which the speed of the standard is brought into agreement with that of the meter under test and the position of which shows the per cent error. The controls at the operator's left are for load and voltage settings for different meter capacities. The lens, prism and ground glass assembly by which the stroboscopic effect is magnified and made visible is in the housing at the end of the tube into which the operator is peering. These illustrations show the socket meter receptacle and the prism arm which were later removed.

Frank Shaw, Washington Water Power Company, customer service clerk, confers with a customer. On his desk is the dictograph equipment which permits direct communication with key departments

Customer Contacts Streamlined

Trained Personnel and Modern Equipment Provide the Washington Water Power Company With a Customer-Service Set-up That Pays Off in Good Will

FIRST electric utility in the far West to streamline its facilities for greeting its customers —substituting the tête-à-tête for the cold discourse across a forbidding counter—is the Washington Water Power Company. Its scheme for handling all direct contacts with consumers who enter its office at Spokane is one which pays dividends in intangible but invaluable tender—friendship and better public relations.

Suppose, for example, that a woman enters the office to open an account. Here's what happens. It is very simple:

She is courteously greeted by a customer - service representative, seated in a comfortable chair beside, not across from, a small, not large, desk. Essentially, from her standpoint, that is the whole story—courteous treatment, congenial atmosphere, comfortable surroundings. She does not need to wait, or to move, or to wonder if some one is behind her eavesdropping on her recital of personal statistics which she considers to be quasi-private property. The interview proceeds without interruptions. Her interest, for the moment, is this man's main business. His telephone does not interrupt. All arrangements made, she leaves the office, satisfied and pleased.

Behind this scene, making it possible, is a well co-ordinated system, which depends for its smooth operation on three principal factors: First, efficiency and acumen of contact personnel; second, availability of records, and third, adequate communication facilities. The behind-the-scene sequence is like this.

PUBLIC RELATIONS SERIES

Training program provided

The courteous treatment is the result of a training program, provided for all members of the customers' service department. Departmental problems are discussed at meetings held one night each week. Program includes a written quiz and the issuing of a weekly supplement to the training manual.

Freedom from telephone interruptions, which the customer unconsciously appreciated, was the result of a deliberate plan, which relieves personal service representatives of

receiving calls while they are talking with customers.

Spearhead of the whole set-up is the contact desk, where the interview is taking place. The work done here can be effective only to the extent that information in the credit department, bookkeeping department and service location record department is made available. Connection of these departments with the contact desk is by means of the house telephone dictograph system.

Contacts two departments

When the personal service representative has secured necessary information from the prospective customer, such as name, address, etc., he depresses two keys on the switch box on his desk, thus signaling the two departments. Both departments respond in a similar way, lights on the switch box at the service desk indicating that communication has been established. Girls in both departments are instructed to answer by signal only, to wait for the customer service man to start talking first. When both lights are on he gives his information, this being transmitted to both departments.

The credit department girl is concerned only with the credit rating. If this is favorable she depresses a key which gives a green-light signal at the service desk. If the credit status is unfavorable she informs him of this fact.

The service-location-record girl secures all information essential to opening and entering the account. When she heard the name of the customer given she knew which credit file section was involved, and she thereupon pressed a key connecting to that section. She was then able to determine, by a green signal or by overhearing the conversation, whether to put through the order to open service or to hold the service order for follow-up by the credit department.

Modern filing makes possible the quick response from the two departments. Service location records are installed in Remington-Rand Kardex safe files. These carry considerable information on the visible edges, so that such information as whether the account is open or closed can be ascertained at a glance. The files are divided in three sections with a dictograph and operator for each. The service representative is familiar with the division of these sections, thus immediately localizing his request by signaling the proper one.

Credit records are similarly filed and sectionalized, and the Soundex system of indexing is used. The desired card is almost instantly available.

The bookkeeping department is set up on the basis of unit bookkeepers, each caring for his own group of meter-reading routes. He keeps the meter-reading books and billing cards in tubs beside his desk, and here again information is available to the service man almost instantly upon his selection of the bookkeeping section.

"Transfer accounts" and "close accounts" are handled in a similar manner.

Better technique seen

Washington Water Power feels that the time of handling a complaint is governed by the nature of the complaint and the disposition of the customer, hence that complaints and adjustments are handled very little faster by reason of the new system. The benefits will grow out of continued improvement in the technique of dealing with customers and the public good will which is bound to be spread about by customers who are always treated with dispatch and courtesy.

At other end of one line of communication, the credit department. Modern files used for quickly ascertaining status of an account. The clerk is Miss Anna Jones

Another key department. Emmett Talkington, unit bookkeeper, has both dictograph and meter-reading files within his reach

Editorials

S. B. WILLIAMS, Editor

War-Time Capacity Requirements

THE million kilowatts of steam-generating capacity which the electric utilities in the major industrial area of the country promised to purchase immediately represents the current peace-time requirements of the industry in that area. In admitting this, the National Defense Power Committee, on which is represented the Army, Navy, Federal Power Commission, SEC, and others, confirmed what this paper has said so often, that no peace-time power shortage was in the making.

That there is a backlog of electric utility expenditures is admitted, but at no time has the industry permitted the continuity of its service to be endangered.

For the warm-time needs the committee is going to require additional capacity, probably running in some cases up to 30 per cent or more beyond the total peace-time capacity. No intimation of how much this additional capacity will aggregate or when a beginning on its installation will be required has been made. A detailed study of individual industrial units in the area is being made. The results of this study, which will not be completed probably for another two months, at least, should, when divulged, better indicate what to anticipate.

This additional war-time capacity, if we understand the committee rightly, can be only reserve. In other words, the committee has expressed the thought, in determining war-time requirements, that there should be no restriction of peace-time use. The reason, of course, is the preservation of public morale.

If such be the case, then one of two courses would be open. One would be new capacity where high efficiencies were sacrificed to extremely low-cost design so as to keep down the fixed charges. The more likely course is the installation of efficient base-load units replacing older and less efficient capacity, which will become the reserve.

In either event, the provision of this extra reserve is not going to be simple financially. The first cost would not be too difficult were one to know more about where the additional annual charges were coming from.

If the War Department is serious about power for national defense and has not permitted itself to be used as a cat's-paw to pry loose capital expenditures from a hesitant utility industry, then there can be no compromise. National defense comes first, and good public policy demands that the industry co-operate fully to see that sufficient power is available to supply war-time needs.

But the responsibility is not all one sided. If the committee is going to recommend the installation of additional capacity to serve only additional needs imposed by war, then it should recommend action that will permit the utilities to so co-operate without being penalized.

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Minor Executives Also Need Cultivation

IN SO MUCH of the thinking on industrial or employee relations there is a forgotten man to whom attention should be drawn forcibly—the minor or sub-executive. Here is a man who directs the activities of others, who gets a fair but not large salary, who in all probability has had a college education, who has ambition and ability. This man needs attention because of the effect he can have on those under him, because he represents an investment, because his progress can cause the emulation of others down the line, because he probably has capacity for further growth, because from this group the next leaders are coming.

How many of the very top executives know by name all of these minor sub-executives? What do they know of these men outside of working hours, of their hobbies, their ambitions, their homes, their worries, their financial and social situation?

And what do these men know about the company, its condition, its future, its activities, problems, plans?

Are these men being handicapped in any way in promotion or in compensation? Are they losing ambition because of seniority blockades? Have they been allowed to drift into blind alleys? How many of these men feel that they have been so long with the company that they couldn't get a job elsewhere and therefore have to take what they get and like it? How many times have men with ideas been discouraged because they could not get the attention of one of the top men? How often does the unsympathetic attitude of a superior prevent these men from making suggestions? How often do superiors, through fear of their own job, purposely sidetrack men directly under them?

These questions could be multiplied many times. They cover situations that should never be allowed to exist and which in a substantial manner can be corrected. It requires a greater interest on the part of chief executives in the men below them.

It may need some executive adviser or father confessor to whom these men can come in confidence and

discuss their own problems, their ambitions, their opportunities for advancement, their desire to change to some other department. It certainly requires more of the human approach than exists today.

Another avenue of attack on this problem lies in discussion groups of these men. It will surprise some utility officials how much of their major and minor executives do not know about company affairs and problems. Men get centered in their own work and seem never to find the time to survey the operations of the company as a whole.

We commend this group of employees to the attention of the top executives. The possibilities of their further human cultivation are limited only by the ceiling depicted for them by their superiors.

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Time for Filing Integration Plans

THE DEADLINE for filing integration plans with SEC by holding companies to meet the provisions of the Public Utility Act is less than two weeks away. While the commission announced that tentative or preliminary plans would comply with its requirements for filing at this time, it is known that in several instances rather comprehensive and substantially complete plans will be filed. This does not necessarily mean that such plans will be approved as submitted, but it does mean that they will receive hearing early and, barring accidents, will the more quickly be able to make decisions with a feeling of security that they will be able to carry them out without interference.

It must be apparent to those utility men who have had occasion to confer with SEC officials that while the commission has no authority to administer the law other than as written, it does intend to interpret the act practically. The attitude of the commission apparently is to do all in its power to protect the financial integrity of the industry. It appears to be mindful of its obligations to investors and to an industry that needs encouragement in order to expand.

Section 11 has been called the "death clause." The President has called it the "health clause." At the time he made this remark it was looked upon as another wise crack. Now, however, one is inclined to believe that "he may have something there," especially if the act continues to be administered with the same degree of reasonableness that appears to characterize the work of the present commission.

There can be no doubt but that a considerable part of the decisions to defer rehabilitation, construction and expansion plans has been the direct result of not knowing the future system pattern which would evolve from the integration. Obviously, a company is not going to spend money on a property which it may not own next year. Likewise, new financing, and to some degree refinancing, is more difficult under conditions of uncertainty.

These conditions are not unknown to the commission, and for that reason it is equally anxious to give effect to the act as quickly as possible through hearings, out of which will come, not necessarily final approval, but at least patterns which will remove inhibitions to growth.

While it is not within our province to advise any company what it should and should not do, it does seem prudent for systems not to defer hearings because of poorly drawn plans. For one thing, it is much more comfortable to operate under a plan more or less of one's own making than one improvised by some outside authority. Also, normal growth of demand is going to improve the necessity for expenditure of substantial amounts of money, the cost of which, or the availability of which, may be influenced by the extent to which the system pattern has been determined.

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Crossing the Line

AFTER more than a year of minus signs in the weekly record of power output compared with that of a year ago the industry is once more on the plus side. The output for the first week in November crossed the line. The gain was small, being but a fraction of a per cent. Nevertheless, it did register a new peak production for the first week in November.

In the second week the gain over 1937 was confirmed, rising to 1.5 per cent. Moreover, the gains were increasingly widespread. More geographical regions were involved and now all but one of them, the Rocky Mountain, have crossed the line.

Sectional differences in this connection, however, are no indication of comparative strength or weakness, but rather are a confirmation of the timing of the depression last year. Where industrial production fell off earliest last year it was natural to expect comparative improvement to come earlier this year.

Statistics such as these would be rather dreary to most people were it not for their significance.

This is the best news we have had for some time because it injects a change in thinking—it builds up optimism. The psychology of crossing the line is one of expansion rather than retrenchment, of doing things. It's good for business.

In another two or three weeks there may be the further news of once more establishing a new peak output week. Peaks encroach upon generating and system capacity reserves. These encroachments have to be made up with equipment purchases. The holiday in utility buying that began a little more than a year ago cannot continue in the face of the new trend of output. Peaks demand attention.

See Curb on New Reforms

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

POLITICAL expediency would seem to dictate that for the next two years President Roosevelt do nothing to tear the Democratic party to pieces. This would mean that he would bring forward no violent new reform moves, attempt no new harrying of business and go no further in putting the government into competition with private capital, specifically in the electric business.

Indeed, it is probable that if Louis McHenry Howe were still alive this is the course that would be followed. But the adroit Louis is no more. That shrewd political mind, uncanny in its accuracy in "feeling" reactions, and consecrated solely and unselfishly to the crusade to build up his beloved chief, is no longer at Roosevelt's disposal. Nor did Louis leave any successor who dared to warn the chief when something stupid was proposed.

Howe not present

It is interesting to note that Louis was not at Roosevelt's elbow when the Supreme Court enlargement was proposed, or when government reorganization was pressed, or when Arthur E. Morgan was thrown to the wolves. There are those who think that Roosevelt never made a mistake when Louis was around to say "No," and that the President has not done anything to justify his reputation for political sagacity since Louis died.

Close to the President now are men whose minds go along with his, but who have never had to get out the vote in running for elective office. Harry Hopkins is No. 1 at present in the President's favor, has been for more than two years, seems likely to stay for two more. Harold Ickes comes pretty close to being No. 2. Cohen and Corcoran are close behind. Jim Farley, despite his magnificent job in the New York state fight this year, is way down on the list. His judgment has been ignored on nearly every important political decision outside New York state. Notably on the Supreme Court and purge campaigns.

But let's look for a moment at the political situation, as it appears following the primaries and election.

In the first place there has been a lot of loose talk about the "Republican victory." Actually it was a Democratic victory. Counting only the states in which the Democrats won unequivocally, the total electoral votes they would have garnered adds up to 302, whereas only 266 are necessary to elect a President.

Here is the list:

Alabama	11	Nevada	3
Arizona	3	New Mexico	3
Arkansas	9	New York	47
California	22	North Carolina	13
Florida	7	Oklahoma	10
Georgia	12	South Carolina	8
Illinois	29	Tennessee	11
Kentucky	11	Texas	23
Louisiana	10	Utah	4
Maryland	8	Washington	8
Mississippi	9	Virginia	11
Missouri	15	West Virginia	8
Nebraska	7		302

In every one of these states the Democrats elected *all* state-wide offices and elected substantial majorities of the congressmen. In New York State Tom Dewey's spectacular run was given the publicity, but Bob Wagner, whose name is tied up with a New Deal measure close to the top of the list in being anathema to conservatives, was elected by half a million! So was his senatorial running mate, James Mead, a 100 per cent New Dealer who has virtually been Roosevelt's mouthpiece on the TVA investigating committee. Also, the Democrats elected two congressmen-at-large and carried 24 of the 43 congressional districts.

Also, to this list should be added certain other states, which most observers agree would have gone Democratic in a presidential battle, though Republicans divided the honors on November 8. For instance, Colorado, where Democratic Senator Adams was handsomely re-elected and the total vote for all Democratic congressional candidates far exceeded the similar G.O.P. total. It should be noted that the list does *not* include Indiana, where the Democrats elected a "yes, but" senator and most of the state officers, nor Iowa, where another target for the purge won out by a small majority.

White House defeat

In fact, it is only by adding in the "purge" senators that New Deal enemies scored a real victory. The election *was* a defeat for the White House, but *not* a Republican victory. Of the nine senators who voted against the President on the Supreme Court, for example, every one was renominated, and only one, Lonergan of Connecticut, fell in the election. Yet even in Connecticut there are factors to consider, when appraising the situation with a view to the next presidential election. In the first place the Socialists piled up around 150,000 votes—plenty to have kept the state Democratic had there been a sharp cleavage between radical and conservative in a presidential battle. In the second place the recent scandals had hurt the local Democratic candidates. And finally, after all, Connecticut was one of the six states which Hoover carried in 1932.

All of which would seem to prove that if Roosevelt just will not rock the boat during the next two years the Democrats will win the presidency again. It has been fifty years since any party elected a President that did not win control of the House two years before. This time the Republicans fell far short of such a victory, the Democrats retaining a clear majority of 69.

So the big question is whether Roosevelt will be expedient, or keep on fighting for more and more reform. The arguments which will be pressed to him by the Hopkins', the Ickes', the Corcorans and the Cohens are clear. They do not believe it is possible for the Republicans to agree upon any candidate who could beat Roosevelt, even Roosevelt running

[*Continued on page* 115]

News OF THE WEEK

Southeastern Electric Exchange Meeting Draws Record Attendance

Dealer co-ordination, load mortality, purchased power promotion and employee education highlights of two-day convention in Atlanta — See need for utilities to continue policy of aggressive selling

Dealer co-ordination, load mortality, purchased power promotion and employee education highlighted the two-day meeting of the general sales conference of the Southeastern Electric Exchange held in Atlanta, Ga., last week, under the chairmanship of S. P. Vecker, sales manager Carolina Power & Light Company, with a record attendance of nearly 200.

The first day was given over to parallel sessions on merchandising, power sales, lighting, rural electrification and promotion, with a joint luncheon meeting at which Charles E. Ide, vice-president and general manager East Tennessee Light & Power Company; C. E. Greenwood, commercial director Edison Electric Institute, and S. B. Williams, editor ELECTRICAL WORLD, spoke.

Chart shows organization

A paper by Wells M. Stanley, vice-president Alabama Power Company, on sales organization opened the executive sales conference. A chart of his organization divided the operations into large and small customer contacts with important activities each headed up with capable men.

Utilities cannot give up merchandising until the business is well developed by the manufacturers and dealers, according to R. B. Roberts, general sales manager Florida Power & Light Company. Dealer co-ordination is a necessity, he said. Subsidies are an admission of high prices and can never be a substitute for aggressive selling. Unless a fair profit can be made in merchandising it should be given up.

Four reasons why new industries work should be carried on by utilities were given by C. A. Collier, commercial vice-president Georgia Power Company. These are the effect on public relations, political effect, revenue and reserve pool to take care of load mortality, and the most important is public relations.

W. A. Moore, vice-president Mississippi Power & Light Company, said that the way to meet Diesel competition was through salesmanship. The technical and engineering approach must give way to selling. He emphasized the collateral advantages of purchased power and pointed to the need for some dramatic way to present them.

There are six things to do to lessen load mortality, according to E. W. Ashmead, sales manager Tennessee Electric Power Company. He gave these as: (1) Reliable service with prompt handling of complaints; (2) personal customer contacts; (3) engineering advice and cost analyses; (4) promotion; (5) education of customers to look for all factors in service when studying competitive rates; (6) group meetings of like types of customers.

The employee education program of the Georgia Power Company, which has been in effect for about fifteen months, was described by J. M. Stafford, Jr. This plan, which is entirely voluntary, through discussional groups with leaders, gives employees information on company problems and activities, creates better relations between employees and department heads, invites employee criticism, suggestions and help in making policy, gives training in public speaking, supplies facts and encourages greater interest in public affairs. The plan has since been extended to the executive group.

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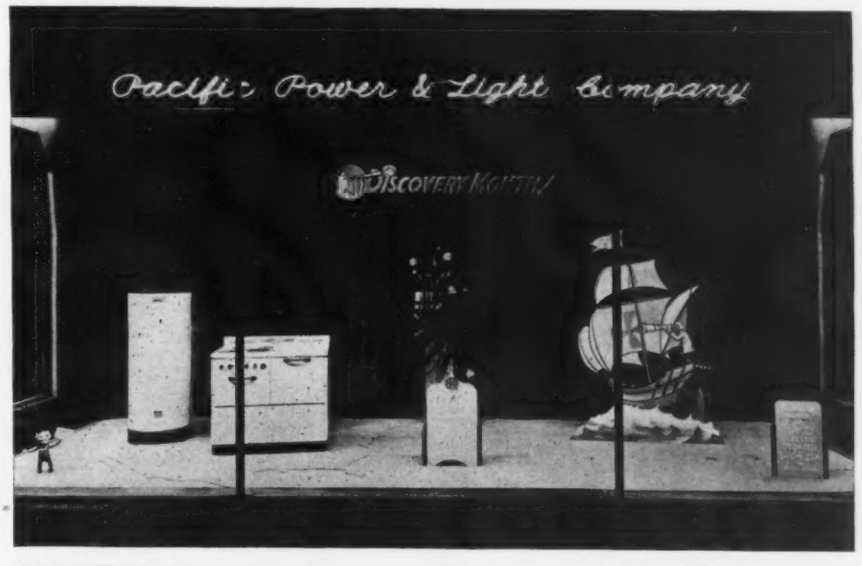
Alabama Town Plans System

Tarrant City, Ala., is planning to build its own distribution system at a cost of approximately $240,000. Lide & Adler of Birmingham are consulting engineers for the project.



WINDOW DISPLAY—Pacific Power & Light Company, Yakima, Wash., used this effective display to further the "Discovery Month" campaign on electric ranges and water heaters sponsored by the Modern Kitchen Bureau during October

Municipal Ownership of Utilities Seen Losing Interest of Public

Counties in Northwest divided on benefits of Bonneville power — Voters in other sections fail to show anticipated turnout to decide proposals — Secretary Ickes sees swing to public power policies

Muncipal ownership of public utilities failed to create any great amount of enthusiasm in the elections of last week. In many places where proponents sought to stir up public interest voters failed to turn out in great numbers to decide the proposals. In most places the number of votes cast failed to come up to predicted totals.

Significant was the way the election went in King County, Seattle county seat, the hub of the fight to form public power districts in the Northwest. Here the voters turned down the proposal 10,627 to 8,603. Puget Sound Power & Light and Seattle City Light operate in the territory.

Reject power districts

The electorate in seven counties in Washington rejected the public power district plan, while a like number favored it. The counties opposed included King, Adams, Columbia, Island, Kitsap, Walla Walla and Yakima, served by Puget Sound Power & Light or Pacific Power & Light. The counties favoring included Clark, Grant, Grays Harbor, Klickitat, San Juan, Skamania and Thurston.

Harry Cheek, secretary of the Washington Grange, announced plans to establish a district in King County, despite the defeat of the proposal by the voters. He said the plan will be carried forward vigorously and will be placed on the ballot again in two years. J. D. Ross, Bonneville Administrator, stated he will immediately begin a layout of distribution lines in counties which voted to utilize power from the government's plant at Bonneville.

At Menominee, Mich., the proposal to construct a municipal plant in competition with the Menominee & Marinette Light & Traction Company was defeated 2,410 to 1,512.

Fulton and Hickman, Ky., two towns served by Kentucky Utilities Company, voted bond issues for municipal systems. Fulton voted 605 to 420 and Hickman 430 to 228. Hickman voted $80,000 and Fulton $100,000.

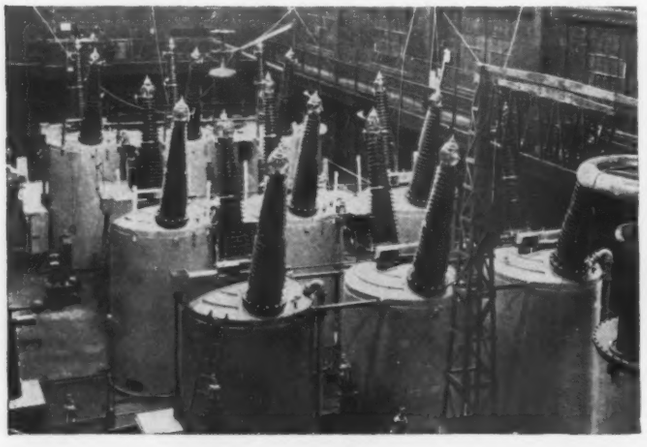
Oklahoma voters rejected by a more than two to one vote the proposed revenue bond act to facilitate municipal utility undertakings.

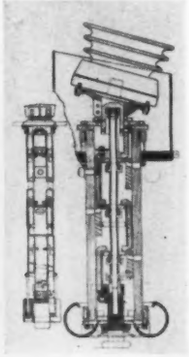
Voters in Bristol, Conn., served by Connecticut Light & Power, showed little interest in expressing public sentiment in regard to establishing a municipal gas and electric system. While the vote carried by a majority of 32, only 3,200 of the 9,400 votes cast in the election were on the utility proposal. The voting was for an expression for the City Council to make further inquiries as to the expediency of municipal ownership. Under Connecticut statutes there must be a favorable vote in two successive years directing the establishment of a municipal system before this can be undertaken.

Secretary Ickes, commenting on the elections in Oregon and Washington, predicted there would be a greater swing by cities and municipalities to public power policies. He said that when Bonneville is completed there is a probability that the counties that refused public power programs would reverse themselves. He forecast that when the Grand Coulee project was completed there would be an additional large number of cities and counties that would adopt public power policies.

Owensboro, Ky., voters approved bond issues totaling $1,300,000 for a combined municipal water and light plant, to be supplemented by a $1,040,016 PWA grant.

Barbourville, Ky., voters approved a bond issue to finance purchase of electric plant by vote of 508 to 170. The City Council has completed plans to purchase existing facilities for an agreed price of $75,000.





BREAKERS ON TEST—Three 5-cycle, 230-kv., 2,500,000-kva. oil blast breakers for the Boulder Dam power plant (Southern California Edison line) in the high-voltage testing laboratory, switchgear factory, General Electric Company. These breakers have multibreak oil blast interrupters (shown at right) of the type recently given field interruption tests up to 2,000,000 kva. at 220 kv. on the system

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Alabama Feels Loss in Tax Collections

The State of Alabama and some counties and municipalities are beginning to feel the loss in tax collections because thousands of acres of rich agricultural lands and other properties acquired by TVA have been removed from the tax rolls, according to Thomas W. Martin, president of Alabama Power Company.

In sending the company's check for $434,963, in payment of the hydroelectric kilowatt-hour tax, Mr. Martin said that this represented only a part of the taxes for 1938. This payment will go to the special educational trust fund.

Declaring that the company's total tax bill for the year would be more than $3,000,000, Mr. Martin said that it represented a vast difference between the $81,665 paid by the TVA, "whose untaxed physical property in Alabama cost as much as or more than ours."

It was pointed out by Mr. Martin that several counties in Alabama have increased real estate assessments in order to offset the loss of taxable property taken over by the TVA.

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Virginia Utility Plans Move

Main offices of the Virginia East Coast Utilities will be moved from Richmond to West Point, Va., shortly after the first of the year, according to O. G. Martin, vice-president and general manager, who said the move is being made in order that the general headquarters may be established in a more central part of the utility's territory.

Close TVA Arguments Before Supreme Court

The fate of the power program of the Tennessee Valley Authority rested with the United States Supreme Court this week as final arguments in the suit brought by fourteen utilities were concluded. The utilities are appealing the decision of the lower court which held such activities constitutional.

Clashes between members of the bench and government attorneys were frequent during the oral arguments. Justices Butler and McReynolds centered their questions on the right of the power companies to sue and whether the government could build dams for the direct purpose of generating and selling electricity in competition with the utilities. Questions were also directed at the purpose of the high dams when flood control dams of the low type were used on the Mississippi.

The utilities contended that flood control and navigation improvements were a "thin veil" for power production, "the real purpose of the TVA."

While arguments were being heard by the court the joint Congressional TVA investigating committee was airing operations of the agency. President Roosevelt authorized the committee to inspect income and excess profits tax returns of all private utilities in the country.

Francis Biddle, committee counsel, said that the corporate returns would be studied to determine the amount of depreciation charged by the Tennessee Electric Power Company, Commonwealth & Southern subsidiary, in its tax returns. He said that there was no intention of delving into utility salaries or of "muckraking" of any kind.

The move by the committee came as Wendell L. Willkie, president of Commonwealth & Southern, was preparing to testify before the committee. Dr. Edward L. Moreland of the engineering department of the Massachusetts Institute of Technology asserted that the TVA yardstick rates were not fair as a basis of comparison with private utility rates. He asserted that instead of allocating 52 per cent of the cost of its cost to power production the figure should be 65 per cent.

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Integration Plans Filed by United Corp.

Further moves by the utility industry to comply with the integration provisions of the utility act were made this week as United Corporation announced that it would reduce its holdings to 10 per cent in any one utility. Previously North American Company and United Light & Power had filed integration plans with the SEC and American Cities Power & Light and Electric Shareholdings Corporation had announced that they were disposing of 775,000 shares of North American stock to a banking syndicate with a view to public distribution.

The transaction of the two investment units, controlled by Harrison Williams, will provide funds for reinvestment and place them in a position to take part in the reshuffling of the utility properties over the next four years.

United Corporation, in reducing its holdings in utility companies to 10 per cent, will also be in a position to use its funds for reinvestment. George H. Howard, president of United, wrote Chairman William O. Douglas of the SEC that "we are both ready and willing to co-operate in the attainment" of the objectives of the geographical integration of operating utilities and the simplification of holding company corporate structures.

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Rush Grand Coulee Work

Concrete is being laid with unusual speed at the Grand Coulee dam, the Bureau of Reclamation reports, so as to complete as much of the program as possible before the advent of freezing weather.

Dexter Names Heads for E.E.I. Committees

Harris Dexter, chairman of the Edison Electric Institute sales committee, announced this week new chairmen of four national promotional programs as follows: George E. Whitwell, Modern Kitchen Bureau; Charles A. Eastman, Better Light-Better Sight Bureau; Philip M. Alden, Commercial Service Cooking Council, and H. J. Gallagher, Electric Water Systems Council.

New committees and chairmen are: Air conditioning (only one committee this year), E. W. Gray, Oklahoma Gas & Electric; lighting sales, John E. Muller, West Penn Power; domestic lighting equipment, Fred S. Dewey, Cincinnati Gas & Electric; refrigeration, Joseph C. Porter, Jr., Kansas City Power & Light; domestic electric cooking, Richard Roberts, Florida Power & Light; water heating, George C. King, Edison Electric Illuminating of Brockton; industrial power and heating, J. Frank Gaskill, Philadelphia Electric; dealer coordination, S. Paul Vecker, Carolina Power & Light; wiring committee, E. A. Brand, Buffalo Niagara & Eastern.

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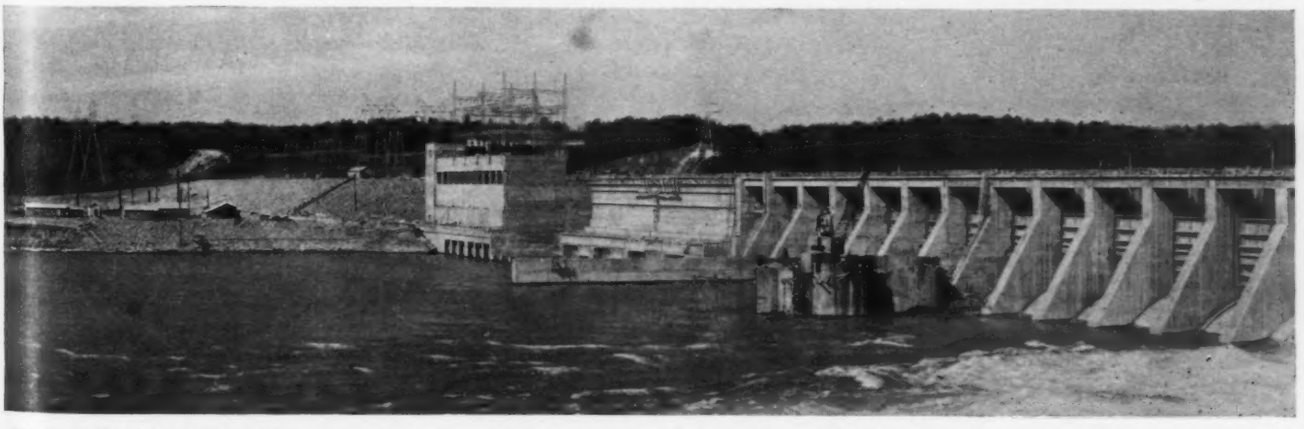
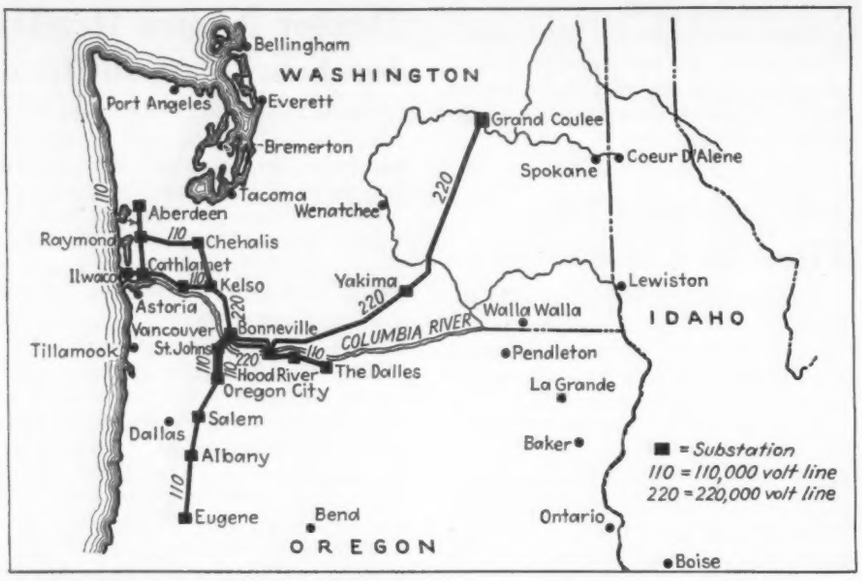
To Clear Right-of-Way for Bonneville Lines

Distribution in Washington of Bonneville power was brought a step nearer with Presidential approval of the project to clear rights-of-way for transmission lines in the state. An allotment of $1,646,630 in WPA funds is included in the approval; an added $427,728 will be supplied by the Bonneville project.

More than 350 miles is to be cleared, including the 220-kv. line linking Bonneville and Grand Coulee. According to the announcement, the lines will run from Bonneville to Grand Coulee, via Yakima, from Vancouver to Aberdeen and from Vancouver into Lane county, Oregon.



PICKWICK LANDING DAM—One of the gigantic hydro-electric projects of the TVA which is the center of controversy in the suit before the Supreme Court brought by fifteen utilities to test the constitutionality of the agency and its power program



BONNEVILLE TRANSMISSION NETWORK—Route of the 110- and 220-kv. transmission lines and the location of the sixteen principal substations in Washington and Oregon as reported by Administrator J. D. Ross. These initial lines are now under construction

New England Plants Push Modernization

Vigorous modernization of industrial plants in New England is under way and in prospect for 1939 embodying practices in about 500 establishments, according to a survey by the New England Council and Engineering Societies of New England, Inc. Seventy-three per cent of the plants consider their present production costs too high, the major causes reflected in percentages of establishments being taxes 83, high wages 68, raw materials 48, machinery not the best available 30, high material handling costs 20, and high costs of machine maintenance 15. Metal products, textiles, machinery, paper, woolens, furniture, printing, food products, shoes, chemicals and granite constituted the principal industries covered.

Installation of new and improved electric motors, control apparatus, industrial heating and lighting equipment is playing an important part in this modernization, as is the study of the economics of purchased versus isolated plant power. Modern material handling equipment (largely electrically driven) has been installed by the following percentages of plants in the several industries: Shoes 55, granite 50, chemicals 47, paper 41, food products 39, metal products 35, furniture 33, machinery 29, printing 28, textiles 24, and woolens 20. Changing of drives for greater efficiency has been under way in the following percentages of plants: Paper 66, woolens 37, furniture and machinery 33 each, food products 30, chemicals 26, metal products 24, textiles 20, shoes 18 and printing 4.

Increased intensity of general lighting has been achieved in 25 per cent of the plants survey, but in some specific industries this figure runs higher. The percentages of plants thus modernizing were as follows: Machinery 44, woolens 33, metal products and textiles 31 each, printing 28, shoes 24, furniture 18, chemicals and paper 16 and food products 4. Still fewer plants have installed special lighting for special processes, the average of all surveyed industries being 20 per cent. Woolens did 37 per cent, textiles 31, metal products 29 and machinery 25, leaving lower figures for the proportion of other plants adopting special illumination. The opportunities for increased modernization are apparent from these data, but the survey shows that from the electrical viewpoint an excellent start has been made toward bringing industrial plants in the northeast up to a level of efficiency which will enable them better to compete with other sections of the country.

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Portland G.E. Purchase

The Federal Power Commission has ordered a hearing for November 29 on the application of the Portland General Electric Company for approval of its proposed purchase of the Mount Hood Electric Company and of its wood-pole, 6.6-kv. transmission line, which is located largely on U.S. land within the Mt. Hood national forest. At present the Mount Hood company purchases its energy wholesale from Portland General Electric.

Announce Bonneville Lines, Substations

Route of the Bonneville high-voltage network and location of the principal substations have been disclosed by Administrator J. D. Ross. At the same time he called for bids on nearly three-quarters of a million dollars' worth of switching apparatus to be installed at those sites.

The substations for the initial transmission lines will be erected in the vicinity of Vancouver, Aberdeen, Yakima, Kelso, Chehalis, Raymond, Cathlamet and North Bonneville in Washington. Substations in Oregon will be located in the vicinity of The Dalles, Hood River, Oregon City, Salem, Albany and Eugene. The Portland substation will be in the St. John's area and a similar site will be chosen near Grand Coulee Dam.

Pointing out that the initial transmission lines do not constitute the entire Bonneville system, Administrator Ross said lower-voltage circuits will be erected into adjacent territory as rapidly as power applications are filed and funds made available. Before leaving for Washington to outline his construction program at budget hearings, Mr. Ross called attention to the fact that a uniform price of $17.50 per kilowatt-year will be charged for Bonneville power.

Oil circuit breakers are the major item in the equipment bids called for; thirteen, with interrupting capacities ranging from 500,000 to 2,500,000 volts, will be delivered within four months after the contract is awarded. Bids will be opened at the project office the morning of November 29.

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FPC Sets Date for Hearing on Holtwood Development

Instituting an investigation of the navigability of the Susquehanna River and the authority under which the Holtwood development of the Pennsylvania Water & Power Company is maintained and operated, the Federal Power Commission has ordered a public hearing for December 6. Hearing is also to determine whether an order should be issued to conserve and utilize navigation and water power resources of this region.

The Holtwood development, with a total installed capacity of 150,000 hp., is on the Susquehanna River between the Conowingo plant of the Susquehanna Power Company and Philadelphia Electric Power Company, operated under FPC license, and the Safe Harbor plant of the Safe Harbor Water Power Corporation, also operated under FPC license.

Preferred Standards for Steam Turbine Generators Are Adopted

National Defense Power Committee approves report of subcommittee for units of 10,000 kw. rating and above — Move seen opening way to accelerate construction and erection of plants for additional capacity

Approval this week by the National Defense Power Committee of the report of its subcommittee on standardization of steam turbine generators of 10,000 kw. rating and above is seen as opening the way for quick production to meet any emergency requirements.

This is the first time in the history of the electrical industry that preferred standards have been set. They were made with the view of expediting production and reducing costs. The adoption of these standards is expected to accelerate materially the construction and erection of generating stations to provide additional supplies of electric energy. It was stated that the committee is constructing similar determinations for generators of smaller ratings.

Set technical standards

Definite standards of pressure, temperature, voltage, power factor and other technical features are provided for nine sizes of condensing turbines, ranging from 10,000 to 100,000 kw., and for eight sizes of superposed turbines from 10,000 to 60,000 kw.

The committee pointed out that in the past turbines and generators of these large capacities have been chiefly "tailor-made jobs" built to order on special designs prepared by the utility engineers. This has meant, it was said, the expenditure of a large amount of time on engineering and design for each machine and has in large part prevented the adoption of quantity methods of production.

The subcommittee, of which Commissioner Basil Manly of the Federal Power Commission is chairman, has been careful in its report to provide sufficient latitude for the modification of the standards to meet the special conditions arising in connection with the installation of new equipment in existing plants or where unusual physical conditions must be met. Any deviation from the preferred standards suggested must be met with the burden of proof on the utility or manufacturer proposing such deviations.

The provisions were emphasized in the technical report prepared for the subcommittee by John C. Parker, vice-president of Consolidated Edison of New York and president of the A.I.E.E., representing the utilities; C. E. Coggeshall of General Electric representing the electrical equipment manufacturers, and Thomas R. Tate, representing the National Defense Power Committee.

This report stated that the immediate objective of the establishment of preferred standards for turbine generators is the maximum speed of provision of power facilities to anticipate peace-time requirements and to facilitate war-time provision of power through elimination of any unnecessary special designs of size.

Participants in the conference included Assistant Secretary of War Louis Johnson, Mr. Manly, Capt. William R. Winslow, Mr. Tate, Lieut.-Col. L. E. Atkins and Commander K. B. Bragg for the power committee, A. C. Flory and R. N. Landreth for Allis-Chalmers, Mr. Coggeshall, A. F. E. Horn, A. R. Smith and A. O. White for General Electric, C. A. Bercow, C. B. Campbell, G. H. Cox, Ralph Kelly, C. F. Lloyd and R. A. McCarty for Westinghouse Electric & Manufacturing Company, K. M. Irwin, Philadelphia Electric, H. B. Gear, Commonwealth Edison, and Mr. Parker for the utilities.

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Albuquerque G. & E. Buys Lumber Mill Power Plant

Albuquerque Gas & Electric Company has purchased the power plant of the New Mexico Lumber & Timber Company of Bernadillo and will spend $150,000 in modernizing the plant, according to Arthur Prager, president.

Renovation and expansion of the power plant, which will include the installation of a 25,000-kva. turbo-generator, will begin in two or three months and be completed in an additional four months. Under the arrangment the lumber company will motorize its entire plant and take power from the utility.

•

Southern Utilities Promote Influx of New Industries

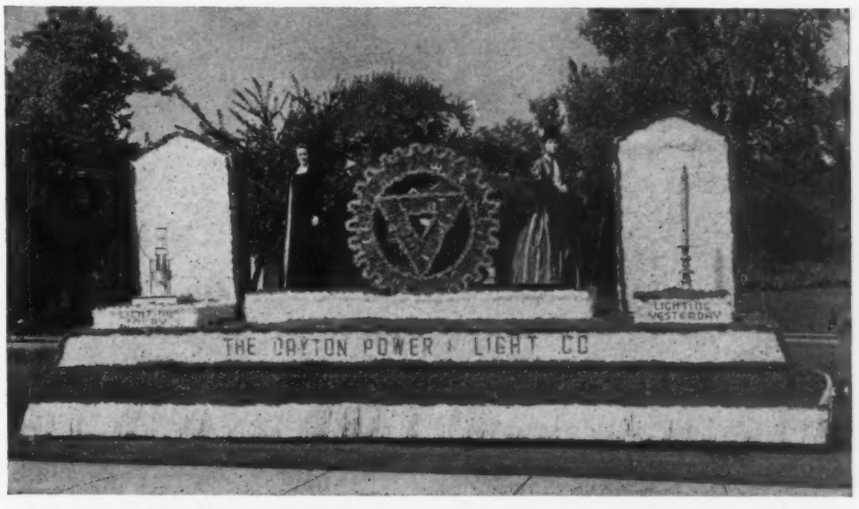
New industries activities by the Alabama, Tennessee and Mississippi properties of Commonwealth & Southern in eight years have resulted in new industries valued at $87,500,000 employing 51,000 people at an annual payroll of $33,400,000. From this the companies derived a direct revenue in excess of $3,500,000, much of which was incremental.

C. A. Collier, commercial vice-president Georgia Power Company, who gave this information before the Southeastern Electrical Exchange Sales Conference, stated that for every dollar of direct revenue one can count on receiving from three to five dollars in indirect revenue.

•

Acquire New Franchises

Sale of the rights and franchises of the West Corydon Township Electric Company to the Pennsylvania Electric Company, Johnstown, and the sale of the rights and franchises of the East Corydon Township Company to the Bradford (Pa.) Electric Company have been approved by the state Public Utility Commission. In each case the outstanding stock was owned by the purchaser.



DEPICTED LIGHTING—When Dayton observed the Northwest Territory celebration Dayton Power & Light depicted the advancement of lighting with this elaborate float. More than 100,000 watched the two-hour parade, in which 25,000 children marched

Power Salesmen Talk on Infra-Red Heating

Industrial applications of electric heating by infra-red rays was the subject that aroused most discussion at the meeting of the Great Lakes Power Club in Chicago last week. G. M. Allen, Detroit Edison, related the development of this method of heating for baking enamel by the Ford Motor Company and presented instances of its application to other purposes. Impressive reductions of required heating time, to one quarter or one fifth or less of that for steam or other previously used agents, have been accomplished by infra-red.

Problems presented by use of utility service for standby or throwover purposes to reinforce reliability of energy supply from isolated plants were discussed by Felix Boldenweck, Commonwealth Edison; M. V. Woodward, Northern Indiana Public Service; R. P. McClellan, Consumers Power; E. L. Kavanaugh, Detroit Edison. How to make this class of service advantageous to the customer without at the same time setting up inducements for isolated plants was discussed.

"The Business of Selling Water" was discussed by Loran D. Gayton, city engineer, Chicago. A very considerable proportion of Chicago's water is pumped electrically. Mr. Gayton showed the relative pumping plant costs for electricity and steam. For an equal volume of pumpage the investment in one, steam driven, was three times the cost of another, electrically powered. Air conditioning, causing almost a doubling of water demand in July and August in downtown Chicago, raises real problems in water supply and these, said Mr. Gayton, are being exhaustively studied to determine their trends and potentialities so that adequate water service may be maintained.

R. R. Cunningham, La Salle Extension University, gave rules on "Selling the Idea." The rule, said Mr. Cunningham, was to get the interview, then sell, then resell, to prevent the buyer from changing his mind.

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SEC Seeks to Intervene in Standard Gas Case

SEC has petitioned the United States District Court at Wilmington, Del., for permission to intervene in the reorganization proceedings of the Standard Gas & Electric Company in connection with the $1,400,000 claims for fees and expenses sought by persons other than banks and trust companies concerned in the reorganization. The SEC charged the claims were out of all proportion to the services rendered.

In its brief the SEC said that arrears on the preferred stock of the company, instead of being reduced, were increased by more than $15,000,000 from the filing of the petition to the date of approval of the plan and that tax claims of the government were still asserted and unpaid.

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Salesmen in Wiring Plan

Residential salesmen of the Los Angeles Bureau of Power & Light will assist in the promotion of the certified adequate wiring plan sponsored by the Electrical Development League of Southern California. A. K. Bennett, of the bureau, will be contact representative with the league.

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I.E.S. to Visit Laboratories

The New York section of the Illuminating Engineering Society, jointly with the Residence Lighting Forum, will inspect the new quarters of the Electrical Testing Laboratories on November 29. The section will be the guests of the Laboratories for dinner. O. P. Cleaver, chairman of the section, will address the November 22 meeting on "Headlines in Lighting for 1938."

Meetings

American Institute of Electrical Engineers—Annual meeting, southern district, Miami, Fla., November 28–30. Winter convention, New York, N. Y., January 23–27. H. H. Henline, national secretary, 33 West 39th Street, New York, N. Y.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y., December 5–9. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Thirteenth National Exposition of Power and Mechanical Engineering—Grand Central Palace, New York, December 5–10. Charles F. Roth, manager, Grand Central Palace, New York.

Edison Electric Institute-American Gas Association—Second annual accounting conference, Palmer House, Chicago, Ill., December 12–14.

American Association for the Advancement of Science—Winter meeting, Richmond, Va., December 27–31.

American Engineering Council—Annual meeting, Hotel Mayflower, Washington, D. C., January 12–14. Frederick M. Feiker, executive secretary, 744 Jackson Place, Washington, D. C.

American Society of Heating and Ventilating Engineers—Annual meeting, Pittsburgh, Pa., January 23–26. A. V. Hutchinson, secretary, 51 Madison Avenue, New York, N. Y.

National Electrical Manufacturers Association—Mid-Winter Conference, Waldorf-Astoria Hotel, New York, February 5–11. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

New Wiring Campaign Opened in Chicago

A large and enthusiastic group of electrical contractors gathered at dinner in Chicago on November 9 to inaugurate the Electric Association plan for selling wiring and fixtures on E.H.F.A. terms. Each contractor's representative was presented with a handsome portfolio, itemizing procedure and showing copies of advertisements and all material to be used.

This plan was prepared by and will be operated under the auspices of the Electric Association and the E.H.F.A., which has opened a district office in Chicago. Wiring and modernization and refixturing in single and multiple family dwellings may now be financed with down payment as small as 10 per cent of the cost of the completed work, 5 per cent carrying charge per year on the balance, which is payable over a period of 24 months. These payments will be collected by the Commonwealth Edison Company on the monthly electric service bill. Balances of $40 or more only will be eligible for financing under this plan.

When a job is completed, inspected and approved the contractor keeps the 10 per cent down payment, endorses the customer's note, without recourse, and receives the amount of the unpaid balance immediately from the E.H.F.A. The contractor must guarantee each job against defective materials and workmanship for one year.

The Electric Association will run large space advertising in daily and neighborhood newspapers over a period of six weeks. Sales letters and folders on adequate wiring are available to contractors for their own mailing lists. Trained men will be placed at their disposal for help on selling prospects. Fixture manufacturers have made available several lines of desirable lighting fixtures at special prices.

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Creditors Bring Action Against Associated Gas

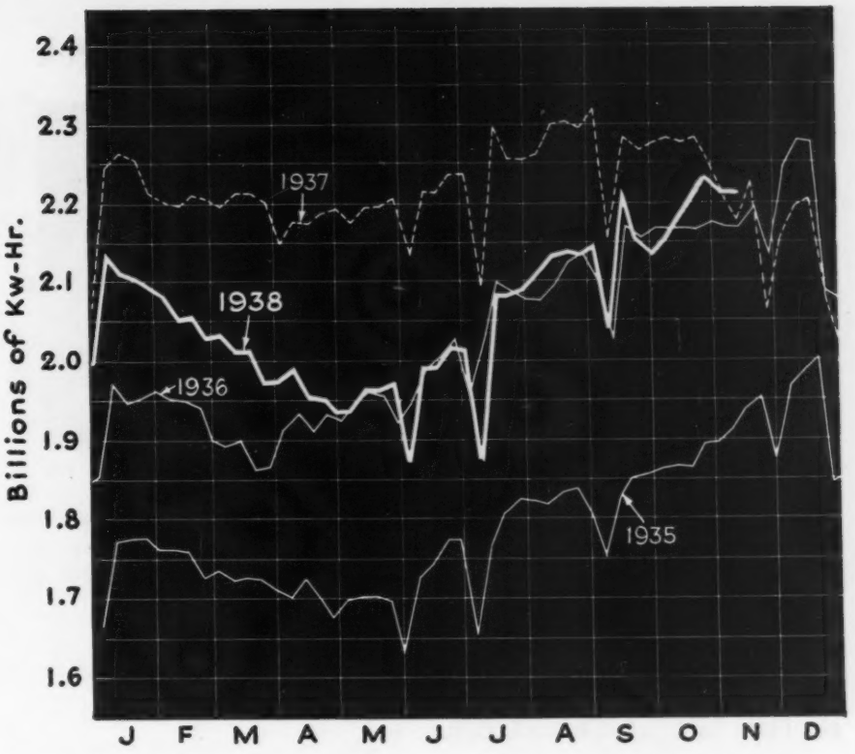
An involuntary bankruptcy petition was filed in the U. S. District Court, New York, this week asking for the appointment of a trustee for Associated Gas & Electric Company. The petitioning creditors were Blanche Creamer and Charles C. Johnson of Brooklyn and C. Raymond Durling, Jr., of Montclair, N. J.

The basic contention of the petition filed was that the parent company was paying dividends for subsidiaries out of funds not properly so applied. The company stated that it had met all obligations to date and will continue to do so.

Output Increases Its Gain Over 1937

With every region except one showing an increase over 1937, the output of the electric light and power industry during the week ended November 12 rose to the highest figure ever reported for a comparable week. It amounted to 2,209,324,000 kw.-hr., a gain of 1.5 per cent over a year ago, according to the Edison Electric Institute, and of 2 per cent over 1936.

Despite the curtailment of industrial activity due to two holidays, the production of electricity was slightly greater than in the preceding week. The new figure confirms the gains announced a week ago, when the curve for 1938 for the first time crossed that for 1937. The greatest gain was made in New England, where the increase of 10.8 per cent over 1937 more than counterbalanced the decrease of 6.9 per cent a year ago. In the Central Industrial, West Central and Southern areas the long series of minus signs have at last turned to plus. In other regions only minor changes occurred.



Per Cent Change from Previous Year

	Week Ending		
	Nov. 12	Nov. 5	Oct. 29
New England	+10.8	+6.4	+3.7
Middle Atlantic	+ 2.4	+3.6	+2.1
Central Industrial	+ 0.4	−3.1	−5.5
West Central	+ 1.6	−0.2	−3.2
Southern States	+ 1.4	−1.4	−1.7
Rocky Mountain	− 3.6	−3.5	−4.9
Pacific	+ 2.9	+2.8	+2.0
United States	−1.5	+0.2	−1.3

Weekly Output, Millions Kw.-Hr.

1938	1937	1936
Nov. 12..2,209	Nov. 13..2,177	Nov. 7..2,169
Nov. 5, 2,207	Nov. 6,..2,202	Oct. 31,..2,176
Oct. 29..2,226	Oct. 30..2,255	Oct. 24..2,167
Oct. 22..2,214	Oct. 23..2,282	Oct. 17..2,170
Oct. 15..2,183	Oct. 16..2,276	Oct. 10..2,168
Oct. 8..2,154	Oct. 9..2,280	Oct. 3..2,169

E.E.I. Figures Show Larger Farm Markets

Steady gains in the number of farms receiving electric service are indicated by statistics announced by the Edison Electric Institute. These show that as of June 30, 1938, the total was 1,330,907, or 30.8 per cent of the 4,328,092 farms having dwellings valued at $500 or more, as reported in the Census of Agriculture for 1930. This compares with 28.7 per cent in 1937 and 24.1 in 1936. Compared with the total number of occupied farms, 6,422,088, service is given to 20.7 per cent.

The highest regional saturation is in the Pacific States, 87.9 per cent. In two other regions, New England and the Middle Atlantic, it exceeds 50 per cent.

Region	No. farms served June 30, 1938	Per cent of farms with $500 dwellings June 30, 1938	Dec., 1937	Dec., 1936
United States	1,330,997	30.8	28.7	24.1
New England	82,304	58.2	56.1	55.7
Middle Atlantic	200,300	54.4	52.3	44.9
East No. Central	372,266	39.1	35.8	28.2
West No. Central	129,873	13.3	12.3	10.9
South Atlantic	141,020	24.1	21.1	16.6
East So. Central	73,087	17.4	15.9	12.0
West So. Central	63,428	12.9	12.1	9.1
Mountain	68,829	41.4	39.7	35.8
Pacific	199,890	87.9	85.1	75.7

In California, the number of farms served actually exceeds, by 5.6 per cent, the number of farms with $500 dwellings, indicating presumably that some of the other 20,000 farms receive service—for example, for irrigation pumping.

Regional data, with percentage saturation given in two earlier reports, are given in accompanying table.

•

Stanford University Offers Store Lighting Fellowship

Stanford University, Palo Alto, Calif., is looking for a man to enroll at once in what is one of the first fellowships of its kind: "to further independent research on store lighting . . . determination of the quantity of illumination and quality of lighting, both general and spectral, needed in retail stores; and the design of efficient illumination systems to meet these requirements."

Open to any graduate student with illumination training or experience, the research fellowship involves a stipend of $800 and $200 to cover cost of such equipment as is needed. Dr. Leland H. Brown of the Stanford illumination laboratory desires applications by December 1.

Ontario Hydro Load Up

Ontario Hydro-Electric Power Commission reports primary load of all systems for September at 1,392,992 hp., against 1,357,367 hp. in September last year, an increase of 2.6 per cent. Primary and secondary loads for all systems totaled 1,722,344 hp., against 1,550,556 hp. in September last year, an increase of 11.1 per cent.

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British Output Advances

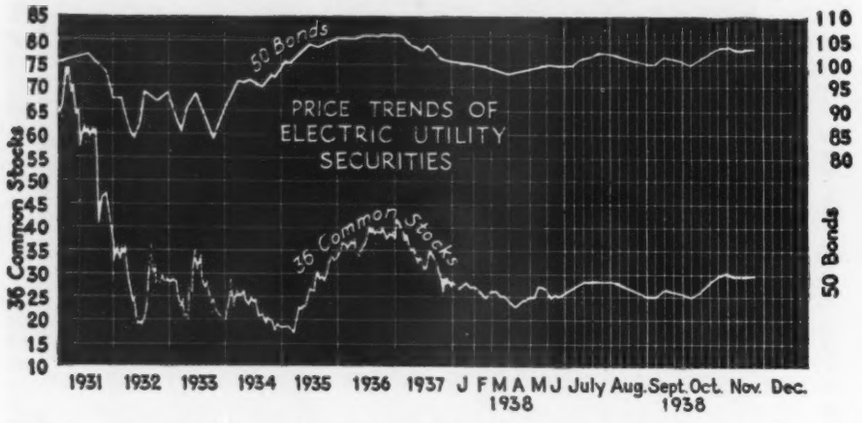
Official statistics recorded with the British Electricity Commission show that 1,872,000,000 units of electricity were generated by authorized undertakers in Great Britain during September, compared with the revised figure of 1,752,000,000 units in September, 1937, representing an increase of 6.8 per cent.

•

Declares Meter Tax Illegal

Assistant City Attorney Harry Burczyk has ruled that a proposal to place a special $2 tax on electric, gas and telephone meters and fare devices in buses, trolley cars and taxicabs operating in Milwaukee is illegal.

Utility Stocks and Bonds Gain in Week


PRICE TRENDS OF
ELECTRIC UTILITY
SECURITIES
50 Bonds
36 Common Stocks
36 Common Stocks
50 Bonds
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10
110 105 100 95 90 85 80
1931 1932 1933 1934 1935 1936 1937 J F M A M J July Aug. Sept. Oct. Nov. Dec.
1938 1938

Electric power and light stocks and bonds made slight rises during the week, with the "Electrical World" stock index up 0.2 point to 29.8; index a year ago, 28.8. The "Electrical World" bond index made an equal gain, going to 103.4 for the week

Plans $55,000,000 Refunding Operation

Directors of the Public Service Company of Colorado have approved a plan to issue $55,000,000 of new securities as a refunding operation. All bonds of the company and its subsidiaries will be called. Action is subject to the approval of holders of common and 7 per cent preferred stock at a meeting to be held in Denver on December 12.

New securities will bear interest at an average rate not exceeding 4 per cent and must mature in not less than ten or more than 30 years. While full details of the plan have not been announced, it is believed that about $40,000,000 of new securities will be first mortgage bonds secured by first mortgage on all of the Public Service Company properties and franchises and properties of subsidiaries.

Selection of other types of securities for remaining $15,000,000 will be governed by market conditions at the time of the issue.

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Stock Revision Planned By Pacific Public Service

Announcement has been made by the Pacific Public Service Company of its intention to reclassify its capital stock. The terms call for conversion of 300,000 outstanding shares of second preferred stock into 60,000 shares of first preferred stock and 280,000 shares of common stock. Present non-voting common stock, of which 262,048 shares are outstanding, would be converted into common stock.

Proposed changes would leave the company with 466,334 outstanding shares of $1.30 cumulative first preferred stock and 702,048 shares of common stock. Both classes of stock would have voting rights on a share basis.

The present capitalization of Pacific Public Service is 406,334 shares of first preferred stock, 300,000 shares of second preferred, 200,000 shares of voting common and 262,048 shares of non-voting common.

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Propose Amendment to Financing Plan

Community Power & Light Company has filed an amendment to its plan of recapitalization under the Holding Company Act, SEC has announced. As amended, the plan provides that each share of present first preferred stock be reclassified into five shares of new common stock and that one share of new $2.50 cumulative convertible first preferred stock be issued in full satisfaction of all unpaid dividends on each present preferred share.

Holders of the present first preferred stock who do not accept the new $2.50 cumulative convertible first preferred stock in satisfaction of dividend arrears will receive a dividend-arrears certificate in the face amount of $43 for each share of the present first preferred stock held, or in such greater face amount as shall represent the dividend arrears on each share at the time of a special meeting of stockholders to act on the plan. The plan will not become effective unless the holders of at least two-thirds of the present first preferred stock approve it.

Each share of present common stock will be classified into five shares of new common stock having a par value of $5 a share. The new common stock will be entitled to one vote a share. The new $2.50 cumulative convertible first preferred stock will be entitled to one vote a share and dividends on it will be payable prior to any payment on or any purchase for redemption of the dividend-arrears certificates and prior to any payments on the new common stock. It will be convertible at the option of the holder into two shares of new common stock, with certain provisions protecting it against dilution.

Hearings which already have been held on the company's original recapitalization plan will be reopened to include the amendments at a date to be announced later.

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Tennessee Utility Sale

The Kentucky-Tennessee Light & Power Company has asked the Federal Power Commission to approve the sale of certain of its facilities to the cities of Paris, Huntington and McKenzie, the town of Ridgely, Weakley County and the Tennessee Valley Authority for a total price of $992,000, of which the TVA would provide $540,200.

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Okonite Calls Debentures

Announcement has been made by the Okonite Company that it will redeem on December 1 all of its outstanding fifteen-year 5½ per cent sinking fund debentures, series A, due 1942, at 102 and accrued interest.

•

A. G. & E. Calls Debentures

American Gas & Electric Company has called for redemption at 106 on December 21 its 5 per cent debentures, due 2028, to the amount of $10,000,000. Funds for retirement of these obligations have been acquired in cash as the result of recent refunding operations of the company's subsidiaries.

•

Utility Earnings Correction

Net income of the Philadelphia Electric Company system for the twelve months ended September 30, 1938, was $20,932,811. Through an error, earnings were reported as $30,932,811 in ELECTRICAL WORLD for November 5.

Utility Reports (Earnings)

	Net Income 1938	1937
*National Pwr. & Lt. and subs.	$8,608,437	$8,696,755
*Southern California Edison	11,165,254	12,235,115
*Gulf State Utilities	1,425,760	1,073,096
*Virginia Elec. & Pwr.	2,251,551	2,212,843
*Electric Pwr. & Lt. and subs.	5,084,387	9,554,165
*United Gas and subs.	6,119,544	11,559,872
*New England G. & E. and subs.	29,497	228,037
*Louisville G. & E. (Del.) and subs.	1,297,111	1,586,307
*Philadelphia Co. and subs.	4,820,125	7,539,391
*Pennsylvania Elec. and subs.	1,635,803	1,722,747
*Buffalo, Niagara & Eastern Pwr. and subs.	6,595,535	9,206,186
*Wisconsin Pwr. & Lt. and subs.	1,183,518	1,110,068

*Twelve months ended September 30.

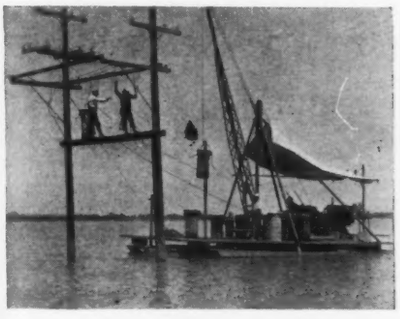
Field OPERATING PRACTICES

New ideas and practices in the operation of well-designed, constructed and maintained plants and systems

Move Transformers With Power Barge

By R. D. LIKELY
San Joaquin Light & Power Corporation, Fresno, Calif.

Last spring's heavy rains and this summer's melting snows flooded an area in central California amounting to 230 square miles adjacent to Tulare Lake. As it appeared that no irrigation pumping will be necessary in the area for several years, removal of distribution transformers was undertaken. About 118 units were involved, mostly 25 or 37½ kva., 12,000/480 volts, worth $20,000. Cost of removal is estimated at $2,000.



Power barge salvages transformers after flood

Barge built by Frank M. North Machine Shop, Corcoran, Calif., and rented to power company and others at $4.25 per hour for work in flooded California area.

Some 75 miles of 12,000-volt line and 2½ miles of 70,000-volt line is in that area, but since the line withstood flood well it was decided to remove only 4 miles of wire where it was necessary to allow a dredger to work along the levees.

To remove transformers, the company contemplated building its own barge. However, as it appeared that other enterprises along the lake eventually would need a barge, it was decided that a barge be built and rented to the power company. The rental was $4.25 per hour, including one operator and the necessary fuel.

The barge is 24x30 ft., supported by six 24-in. pipes extending lengthwise and decked with 3,400 lb. of planking. The driving unit is a 30-hp. tractor using butane. A box, extending into the water below the tractor, contains the gear shift. A chain drive transmits power to the gear box. A shaft extends through the box to the rear, carrying a 24-in. propeller.

The boom has a latticework section 25 ft. long. Within this are guides for a 4-in. steel pipe that may be extended 15 ft. beyond the main part of the boom. The boom may be rotated through slightly less than 180 deg. and raised from practically a horizontal position to a vertical position.

This equipment has proved exceptionally satisfactory for performing the salvage operations.

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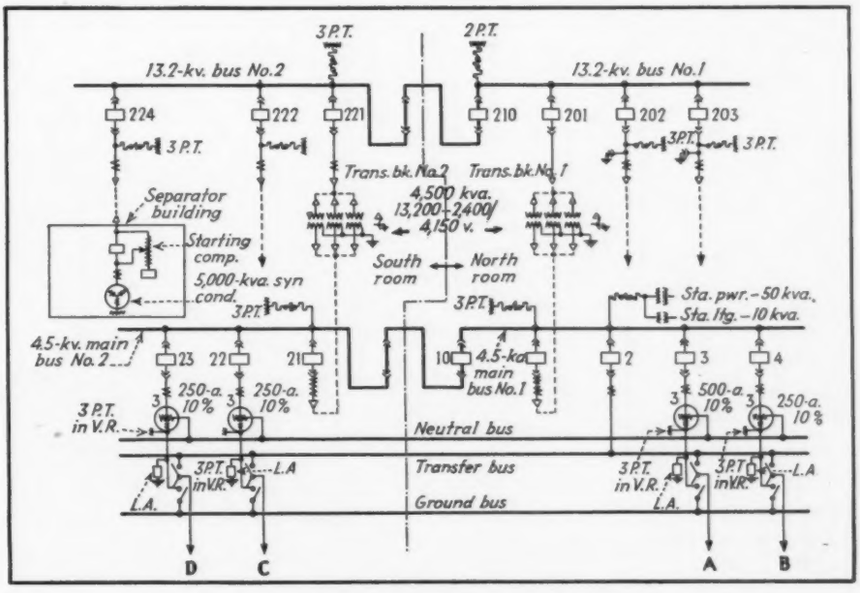
Steel Substation for Steel Town

By E. S. FIELDS
Manager Electric Department, Cincinnati Gas & Electric Company

Outstanding as an example of latest practice in construction and arrangement is the new Middletown distribution substation of Cincinnati Gas & Electric. It is fully automatic, unattended and provided with remote indication to an attended substation 4 miles distant. Rotating equipment, a 5,000-kva. synchronous condenser, is housed in a separate building with inclosed, water-cooled air circulation to eliminate noise. Both buildings



Electrical layout of Middletown substation

are of steel with enameled exterior panels* and are electrically heated. Grounds are landscaped. The 13.2-kv. bus, to which the three incoming lines from two supply sources are connected, has fault bus protection. The synchronous condenser is protected against fire by an automatic carbon dioxide system. Four 4,300-volt distribution feeders radiate from the substation to serve residential, commercial and small power load in Middletown. Eleven automatic street-lighting circuits take energy from these feeders.

Fireproof-soundproof walls

The larger of the two buildings is the substation proper and is divided into three sections by fireproof and soundproof walls. A narrow section across the front of the building is the control room, containing a thirteen-panel steel switchboard. Besides the switchboard, the control room also contains a 60-cell, 120-amp.-hour storage battery and an automatic motor-generator set as a battery charger. The two other rooms of the substation building contain electric switchgear. The north room contains four 13,200-volt oil circuit breakers serving two incoming lines, one transformer bank and a bus tie. This room also contains five 4,300-volt metal-clad switches serving two outgoing feeders, one transformer bank, a transfer switch and a bus tie. The south room has three 13,200-volt oil circuit breakers serving one incoming line, one transformer bank and the synchronous condenser. The south room also has three 4,300-volt oil circuit breakers serving two feeders and one transformer bank. Each section of the 13,200-volt bus has instantaneous bus protection which automatically sectionalizes the bus in case of trouble.

Outdoor transformers

Two 4,500-kva. transformer banks of three 1,500-kva. transformers are in the yard behind the substation. Each of the four 4,300-volt distribution feeders is equipped with three automatic induction feeder voltage regulators, also outdoors in the substation yard. Three of these regulators are of 500-amp. capacity and nine are of 250-amp., all with 10 per cent plus or minus voltage regulation. Space is provided in the present substation layout to accommodate a third transformer bank, two more 4,300-volt feeders and another incoming 13,200-volt line.

* See ELECTRICAL WORLD, July 9, 1938, page 8, for description of buildings.

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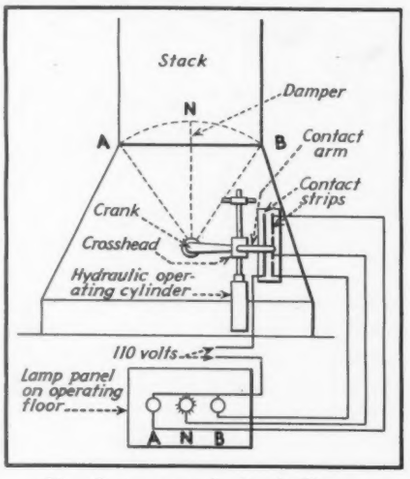
Lamp Scheme Shows Damper Position

Position of stack dampers at the Stamford plant of the Connecticut Power Company is indicated on the boiler room operating floor by a simple arrangement of three lamps energized by contacts on the damper-actuating mechanism on the stack breeching. Details of the arrangement are shown in the accompanying sketch.



Simple contact device indicates position of stack damper

The hydraulically operated damper, located at the base of the stack above two induced-draft fans, acts to cut off the draft from either of the fans, depending upon its position. A hydraulic cylinder operates the damper through a simple crank and crosshead mechanism. A copper contact arm extending from the crosshead makes contact with a different set of copper strips for each position of the damper, completing an electrical circuit and energizing one of the three lamps, depending upon the position of the damper.

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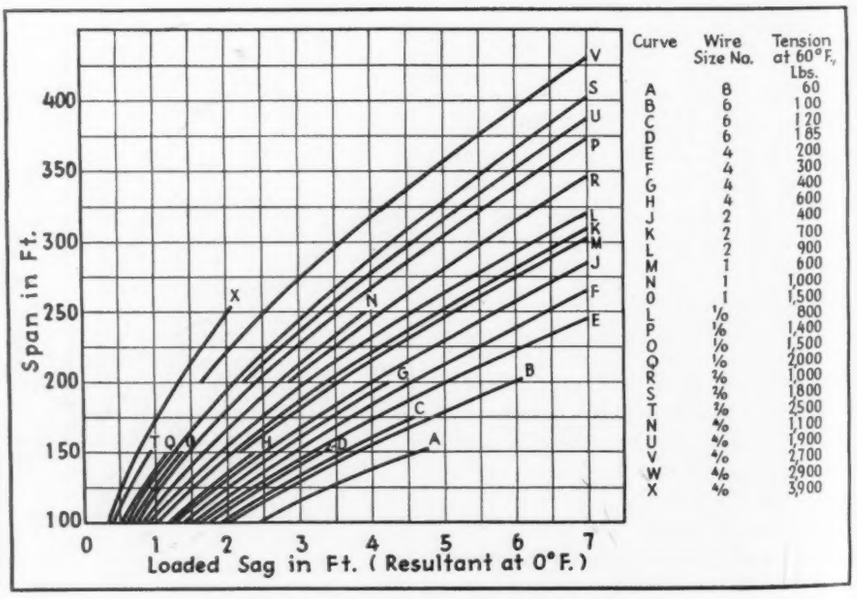
Chart Yields Sag of Loaded Conductor

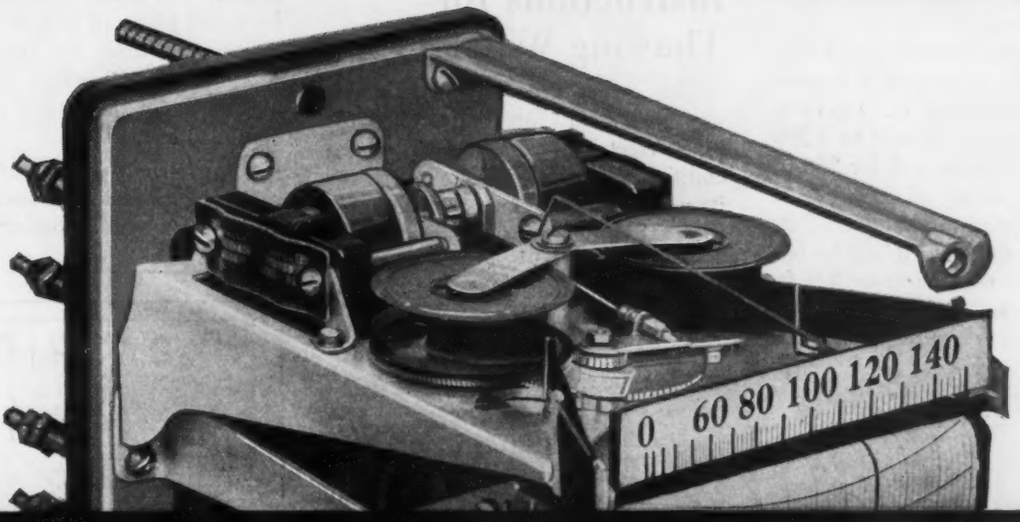
By B. E. ELLSWORTH
Electrical Engineer Iowa-Nebraska Light & Power Company, Lincoln, Neb.

It is often convenient, in order to check clearances, to know the sag a given conductor will have when it is loaded with sleet and wind at 0 deg. F. when the known quantities are size of wire and tension (or sag) at 60 deg. F. The accompanying family of curves and table have been prepared to show the resultant sag at 0 deg. F. for hard-drawn copper wire with sleet and wind loading for the heavy loading district. Sizes Nos. 8 and 6 are solid wire and the others are stranded. The values of tension given in the table are those ordinarily employed for the respective conductors. Interpolation can be made when the value of 60 deg. F. tension does not correspond to one of the curves. The curves can be extended without

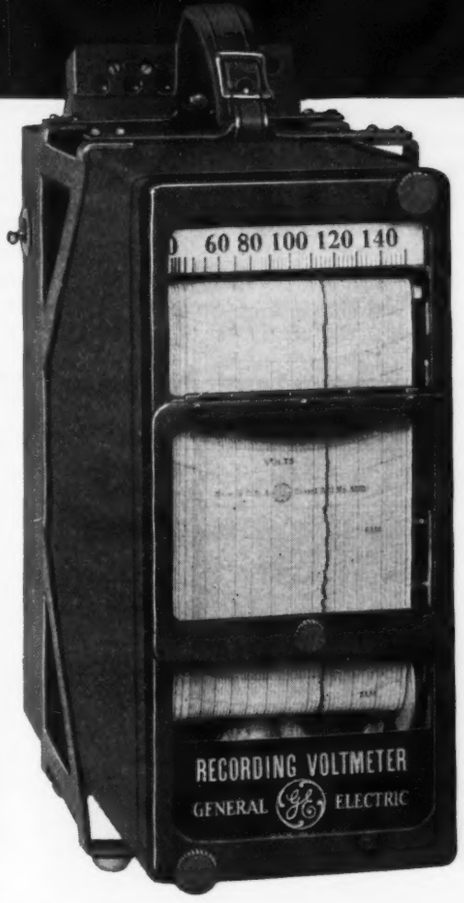


Curve	Wire Size No.	Tension at 60° F., Lbs.
A	8	60
B	6	100
C	6	120
D	6	185
E	4	200
F	4	300
G	4	400
H	4	600
J	2	400
K	2	700
L	2	900
M	1	600
N	1	1,000
O	1	1,500
L	1/0	800
P	1/0	1,400
Q	1/0	1,500
R	1/0	2,000
S	2/0	1,000
T	2/0	1,800
N	2/0	2,500
U	4/0	1,100
V	4/0	1,900
W	4/0	2,700
X	4/0	2,900
	4/0	3,900

Find sags at heavy ice and wind loadings



LOOK AT THE ADVANTAGES OF G-E INKLESS RECORDERS



NOW, with General Electric's inkless Type CD recorders, you get improved performance on those jobs where the use of ink presents difficulties.

That's because there's no ink to spill, no ink to blot, no ink to flood on the record rolls under fluctuating loads.

With inkless recording, a motor-driven stylus uses a standard typewriter ribbon for a marking medium. So there can't be any inking problems due to a clogged system or to ink evaporation.

Maintenance is cut, too. For with the inkless system there's no pen or inkwell to clean; there's no ink to purchase, no pen to start. You simply install the record roll and reverse the typewriter-ribbon spools once a month.

For special conditions—for those jobs where ink recording presents hazards or where extremes in temperature create recording difficulties—you'll find inkless Type CD recorders particularly desirable. They're designed for reliable operation in the temperature range of minus 10 F to 120 F.

These advantages of G-E inkless recorders express themselves in dollars-and-cents terms—and provide greater reliability and increased convenience. For further details, call the nearest G-E office. Or write General Electric, Schenectady, N. Y., for Bulletin GEA-3010.

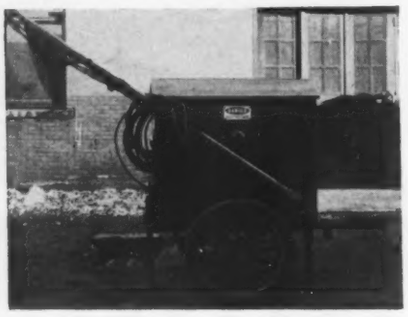
GENERAL ELECTRIC

430-125

much error to accommodate longer spans if required.

As an example, consider No. 1 copper on a 250-ft. span with a tension of 1,010 lb. at 60 deg. F. Curve N for No. 1 conductor strung to 1,000 lb. is sufficiently close and for 250-ft. span indicates a sag of 3.9 ft. At 60 deg. F. this wire would have 1.9 ft. sag. From these values it will be observed that the sag increases 2.0 ft. on this span when loading is placed on the wire. Such a set of curves, for the types of conductors used, is especially handy for long span construction.

SERVICE FIRST ON WHEELS



Transformer carts are available in the electric distribution storeroom of the Milwaukee Electric Railway & Light Company for the purpose of restoring service with the least possible delay. If a transformer on the line fails the trouble man will bridge the feeder in order to carry the load temporarily, but at the same time the trouble department office will notify the storeroom to deliver the cart so the transformer inside may be hooked into the line and thus replace the one which failed, with either no outage at all, or a minimum outage of service. This avoids immediate necessity of rounding up a line gang and permits replacement of the original transformer in the regular routine of work.

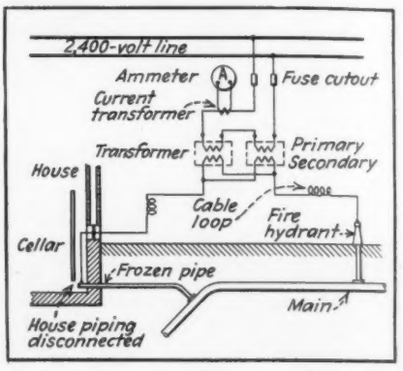
Instructions for Thawing Water Pipes

The procedure of an Eastern power system for thawing water pipes electrically has recently been codified. Extracts are given here for its value in this important technique. Pipe thawing data based in the American Water Works Association's findings are used.

Thawing Procedure—To thaw a pipe, connect the secondary wires across the frozen section, open faucets, valves or shut-offs and circulate thawing current by applying a low voltage, *i.e.*, 60 volts or less, depending upon length and size of pipe to be thawed. Lower voltages can be obtained by introducing reactance into the secondary circuit. Observe amount of current flow before reducing reactance or changing to the higher voltage connections (120 and 240 volts). Reference to the table will aid in determining the approximate amount of voltage required. It is recommended that house piping be disconnected as shown in the diagram, to prevent stray currents passing to gas piping or grounded electrical circuits.

Control of Thawing Current—Current flows may be regulated as desired by changing the electrical connections to include a shorter or longer length of pipe between contacts, or by changing the reactance of the secondary circuit. The latter is easily accomplished by varying the number and size of the current control loops. Close adjustment of current is unnecessary, the purpose being to keep the current flow within reasonable values. Ordinarily, currents of 100 to 200 amp. are sufficient for small pipes (¾ to 2 in. diameter), 200 to 300 amp. for medium pipes (2 to 6 in. diameter) and 300 to 500 amp. for the larger pipes (6 to 10 in. diameter).

Transformers—By connecting the primaries in series across 2,400 volts and the 120-volt secondary windings



Typical connections for thawing water pipes

in parallel 60 volts may be obtained. For 120 volts the standard transformer connections are used. Standard transformers may be safely overloaded 50 per cent or more, due to the intermittent duty required and the low ambient temperatures prevailing when this type of work is done. The transformer primaries shall be suitably fused to permit overloading.

Time Required for Thawing — Time required to thaw pipes depends upon many factors, such as size, length, kind of pipe, location, extent of freeze, condition of soil, ambient temperatures, joints, etc. By circulating 100 to 300 amp. pipes can usually be thawed in from five to twenty minutes.

Table of Thawing Data

Size and Kind of Pipe	Voltages, Transformer Capacities, and Connections required to circulate in 1,000 ft. lengths of various size pipes, thawing currents of:											
	100 Amp. (Two 7½-Kva. Transformers)				200 Amp. (Two 15-Kva. Transformers)				300 Amp. (Two 25-Kva. Transformers)			
	Drop in Pipe (Volts)	*Drop in No. 3/ TBWP Leads (Volts)	Total Drop (Volts)	Trans. Connection (Volts)	Drop in Pipe (Volts)	*Drop in No. 1/OTBWP Leads (Volts)	Total Drop (Volts)	Trans. Connection (Volts)	Drop in Pipe (Volts)	*Drop in No. 1/OTBWF Leads (Volts)	Total Drop (Volts)	Trans. Connection (Volts)
¾-in. Steel	20	24	44	60	45	35	80	120	75	50	125	120
1-in. Steel	15	24	39	60	30	35	65	60	50	50	100	120
1¼-in. Steel	10	24	34	60	20	35	55	60	35	50	85	120
2-in. Steel	7	24	31	60	17	35	52	60	30	50	80	120
3-in. C.I	10	24	34	60	25	35	60	60	45	50	95	120
4-in. C.I	8	24	32	60	17	35	52	60	28	50	78	120
6-in. C.I	6	24	30	60	14	35	49	60	24	50	74	120
8-in. C.I	4	24	28	60	10	35	45	60	17	50	67	120
10-in. C.I	3	24	27	60	8	35	43	60	14	50	64	120

* Connection Leads — 1,000 ft. of single-conductor TBWP wire. (a) Use proportionate values for other lengths of pipes, leads and thawing currents. (b) For wrought iron pipe, use values given for steel. (c) Table based on pipe data published by American Water Works Association. (d) For lead pipe, allow 50 per cent increase in pipe drop.

Versatol Performite Cable

REG. U.S. PAT. OFF

YOU can think of this "ALL 3" combination of Versatol Performite (R-300) insulation in terms of low-cost long-time performance.

Think of 0.01 as unusual ability to resist the effects of moisture, harmful to any dielectric. Think of 75 C as savings in conductor size—and thus in space and cost. Think of 504 in terms of long life and freedom from costly maintenance. Think of the over-all economies.

These specifications, in brief, are the reasons why.

0.01 "The increase in weight . . . by the absorption of water . . . shall not be more than 0.01 gram per sq in."

75 C "The tensile strength . . . after 120 hours in the air oven at 121 C (250 F) . . . shall not be less than 1000 lb per sq in." This is comparable to a maximum allowable operating temperature of 75 C.

504 "The tensile strength . . . after 504 hours in the oxygen bomb . . . shall not be less than 75 per cent of the original value."

For more detailed specifications and their effect on cable insulated with this G-E R-300 insulation, write or see a G-E cable specialist. Address nearest G-E sales office, or General Electric, Dept. 6—201, Schenectady, N. Y.

Type RI
R = rubber insulation
I = interlocked armor

AN EXAMPLE

ARMORED with the well-known interlocked steel, this cable has much to recommend it. The layers of metal tape are so interlocked that the cable is protected throughout; no gaps break its continuity. The rounded shape of the armor makes it strong, tends to deflect blows, and acts as a buffer. The armor can also be made of copper, bronze, or aluminum.

As additional protection against corrosion, if the cable is to be buried in the earth, an over-all jute finish (RIJ) can be applied as well as an under-armor jute bedding (RJIJ).

ALWAYS THE RIGHT TYPE FOR EACH JOB

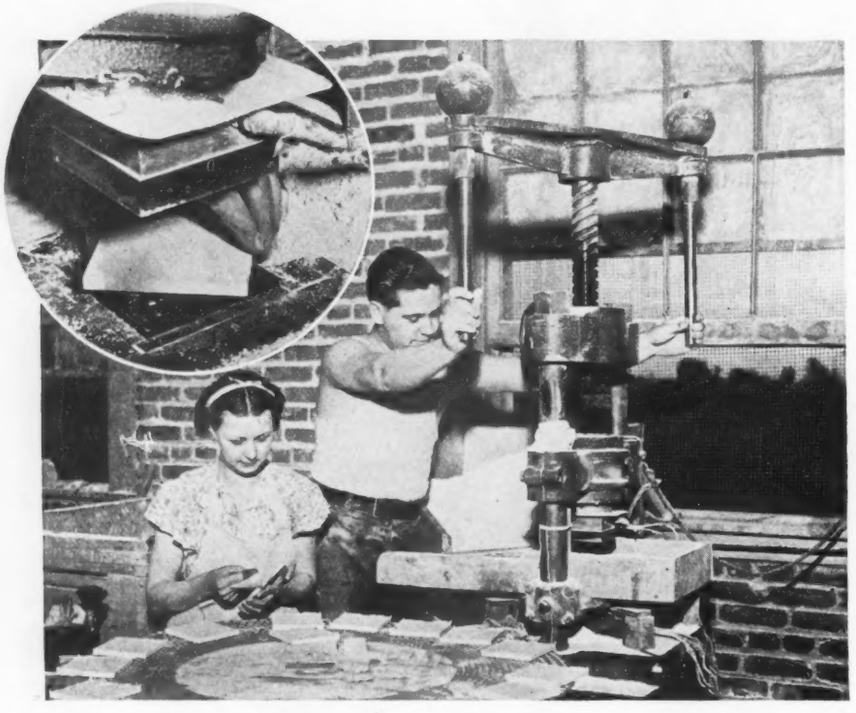
This is just one type of G-E insulated cable that can be furnished with Versatol Performite insulation. There are many others; and you profit most when the type you select is *always* right. To this end, make full use of G-E service and get the most for your cable dollar. Look to the *right* type for long-term economy.

GENERAL ELECTRIC

Filing No. 1200 520-128

Industrial ELECTRIFICATION

New ideas and practices in industrial electrification as presented by industrial, consulting and power sales engineers



Cartridge Units Prevent Sticking

By W. B. CHENEY
Industrial Heating Engineer
Southern California Edison Co., Ltd.,
Los Angeles, Calif.

In the manufacture of wall tile an important step is molding the ceramic between steel dies. Former practice was to prevent sticking by coating the dies with oil after three or four tiles have been run. This slowed down production.

While heating of dies has become accepted in modern plants, primitive methods of heating prevail in many. There is a real opportunity for tile plant operators to improve the operation of their plants by eliminating the hazard and difficulties of control which are attendant upon the use of steam and combustible fuels since electric cartridge heaters have proved most satisfactory for this operation.

In constructing a new tile plant at Downey, Cal., the Downey Tile Manufacturing Company made provision for using electric heat on its dies by installing a special three-contact outlet at each molding press. A three-heat switch ahead of the outlet controls the input.

Cartridge heaters are inserted in both top and bottom dies. Wattage depends on die size. For $4\frac{1}{4} \times 4\frac{1}{4}$-in. dies it was found that a 100-watt, 230-volt heater in each proved satisfactory. With this arrangement two heats are available—200 watts on high and 50 watts on low. Medium provides for heating only one die and is not ordinarily used. By using two heaters in each die three heats can be made available, but this refinement is not necessary in most cases.

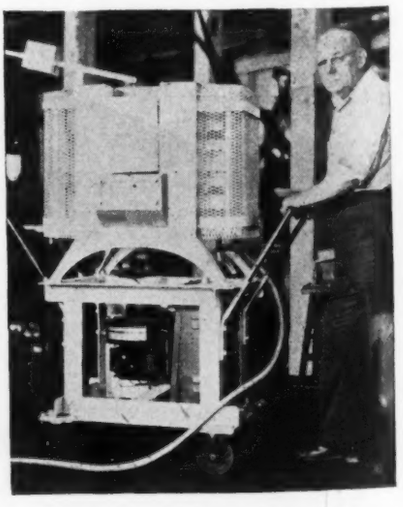
Leads from the heater are connected to a three-pole plug so that dies can be changed without removing the heaters and by merely unplugging and plugging into the special outlet.

•

Portable Furnace Takes Slugs to Job

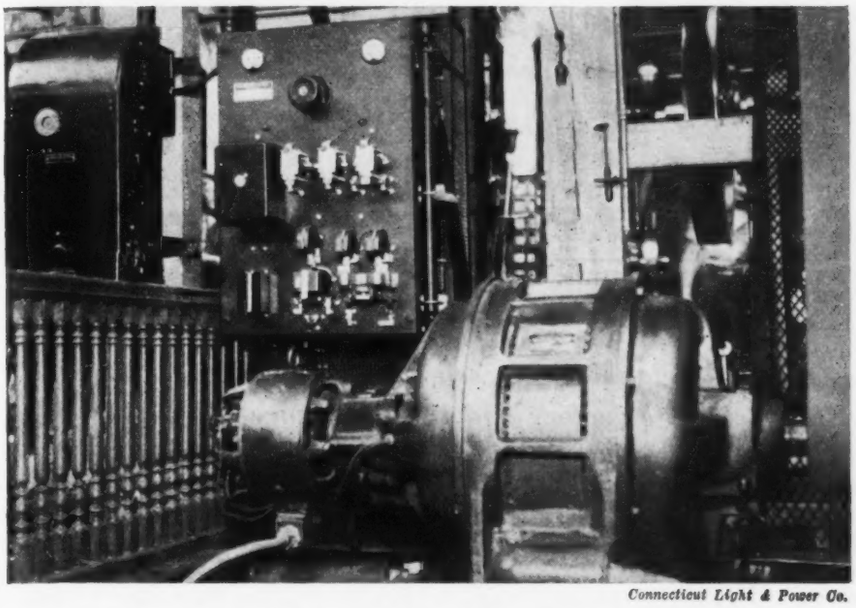
When hot slugs were carried from a distant coal-fired forge in the Waterbury (Conn.) Buckle Company to the forge presses, they cooled in transit and time was wasted as well.

As a result, a portable Sentry electric furnace was developed to meet the situation. Rated at 16 kilowatts, this furnace is mounted on a hand



Slugs wheeled to job in furnace

MOTOR CHANGE SAVES $180 YEARLY



Connecticut Light & Power Co.

Power factor study showed that a saving in power cost of $180 a year could be saved by the Waterbury (Conn.) Buckle Company if a 35-hp. induction motor was replaced by a 60-hp. synchronous motor operating at 80 per cent power factor leading, as the main shaft drive in the pressroom. The change was made and the new installation, shown, in addition to the saving in power cost has considerably improved plant voltage conditions. Maintenance costs tend to run low with type of equipment.

truck and equipped for plugging by flexible cable into any of five 220-volt outlets in the vicinity of the dozen presses in the forging department. Now the slugs are supplied at the proper temperature and scale-free forging results.

•

Switzerland Yields Data on Ski-Lifts

Winter resorts may find interesting the following on electric "Ski-lifts" from an issue of *Oerlikon Bulletin:* With a motor output of 24 hp. about 330 ski-ers can be conveyed uphill per hour over a distance of about 320 meters. The ski-ers let themselves be drawn on their skis by devices attached to an endless moving cable. The Davos installation transported during last winter more than 110,000 persons. So far a total of half a million persons have been conveyed by such ski lifts in Switzerland without an accident, negotiating at times inclines up to 70 per cent (1 in 1.43).

The electrical driving equipment is normally located at the lower-station, while the upper station only serves as point of return of the rope and requires no supervisory staff. An accidental over-running of the section is prevented by a cable drawn across the track, which, in the event of a ski-er coming into contact with it, opens the motor switch and brings the installation to a standstill.

Ski-lifts are now being built elsewhere in Switzerland, with motors as large as 80 hp.

Electric sledge-haulage is also becoming popular in Switzerland, working on the same principle as an ordinary cable railway, the only difference being that two articulated sledges are used instead of cars, the sledges being led up and down the snow incline alternately and perfectly silently by means of a cable. The Luzernheide sledge haulage is operated with a 36-hp, three-phase motor, which can be started up in either direction in seven steps by means of a controller. A brake magnet stops the cable drum, and consequently the sledges, immediately, in the event of failure on the power system. A limit switch is provided to prevent the sledges from penetrating too far into the end stations. As a further safety measure, the sledges are provided with two chains which lodge themselves immediately under the irons of the sledge, should the cable break, and bring the vehicle to a stop within a few feet, even on steep gradients. During last winter 73,000 persons were transported on such sledges, the average length of the track being 1,150 meters.

•

Plating Plant Baths Electrically Heated

Electric heat, replacing gas, has eliminated both the objectionable odors arising from the burned fuel and excess heat for employees of the Lumidor Manufacturing Company, plating plant, located at Alhambra, Calif.

Caustic-soda and water-rinse baths, illustrated, are placed side by side and surrounded with three inches of vermiculite, which is held in place by corrugated iron. Each bath is heated with three 4-kilowatt immersion heating units. What appears to be a seventh unit (the upper electrical connection) is in reality a thermostat, located in the rinse tank but controlling all units through a magnetic switch. Normally, temperature is kept near 200 degrees F.

To reduce losses, a heat-insulating cover is put over the tank at night, with a time switch set to return it to operating temperature by working time. Service is at 230 volts, three-phase.

Six 4-kw. immersion units heat baths at plating plant

New ENGINEERING IDEAS

Discoveries, proposals and developments by electrical engineers and scientists in the field, the factory and the laboratory

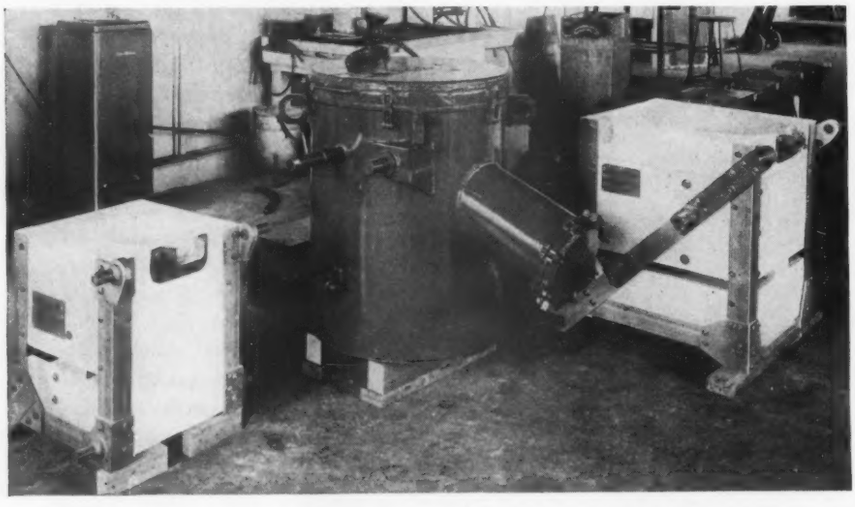
Vacuum Melt and Pour in Induction Furnace

Among the recent developments in the field of precision melting equipment in this country is a coreless induction furnace of 44 lb. capacity that melts and pours its charge in a vacuum of 1 mm. of mercury. Two furnaces of this size and type have recently been manufactured and shipped to Russia by the Ajax Electrothermic Corporation, Trenton, N. J. While furnaces that melt charges under vacuum and pour in air have been built in the past, these units are believed to be among the first of any appreciable size that perform both functions under vacuum.

The illustrated unit, one of those built for Russia, operates at temperatures up to and including 3,300 deg. F. Although rated at 44 lb. (20 kg.) it successfully melted several charges of 50 lb. during test. High-frequency current for the two furnaces is supplied at 2,000 cycles by separate 100-kw. motor-generator sets.

An airtight vessel through which the electrical leads are brought by means of special bushings incloses the heating coil, furnace crucible and ingot mold and is provided with water-cooled sides and top. The vessel is evacuated and a vacuum of 1 mm. of mercury is maintained throughout the melting and pouring cycle by a vacuum pump rated at 26 cu.ft. of free air per minute. A special sealed window is provided in the cover of the furnace unit through which the melter may watch the progress of the melt.

The entire unit is mounted on trunnions so that it can be tilted to pour the molten charge from the retort in which it was melted into the ingot mold. The problem of inclosing the ingot mold within the vacuum-tight casing was met by welding an arm-like projection to the vessel that extends out and down at an angle that allows the metal to be poured readily into the mold in the projecting arm. The arm is provided with a flanged fitting at its lower end through which the mold can be removed after the charge has cooled sufficiently.



High-frequency induction furnace melts and pours steel in vacuum

Vacuum unit is shown flanked on the left by a 33-lb. and on the right by a 220-lb. open-type furnace which may be used interchangeably with the vacuum unit on a 100-kw., 2,000-cycle generator. Furnace units only, without auxiliaries, are shown.

•

Amplifier Displaces Potential Transformer

Use of a vacuum tube amplifier in place of potential transformer to drive a synchroscope is not new. However, apparatus for this purpose in the past has been complicated, bulky and expensive. The recent development of tubes that have high power capability with low plate voltage now makes an entirely satisfactory amplifier possible at low cost.

Such an amplifier has been designed and built for around $50 by the engineers of a Western utility company. It is used to amplify the impulse derived from a 30-ft. antenna of insulated wire strung parallel with and about 10 ft. from one of the conductors of a 132-kv. line which is to be synchronized with the station buses. An insulated lead is brought from the antenna into the station with the amplifier through a synchronizing switch.

The amplifier unit, with its power supply, is contained in a case 8 in. wide, 20 in. long and 8 in. high. The tube line-up comprises a 2A5 driver stage, two 616 G beam power tubes in push pull class AB output and an 83 rectifier supplying the plate potential and a type 45 triode connected as a diode rectifier supplying negative bias for the output stage. The amplifier delivers 20 watts at 110 volts to the field of a G.E. type M-2 synchroscope and a pair of indicating lights. This works the

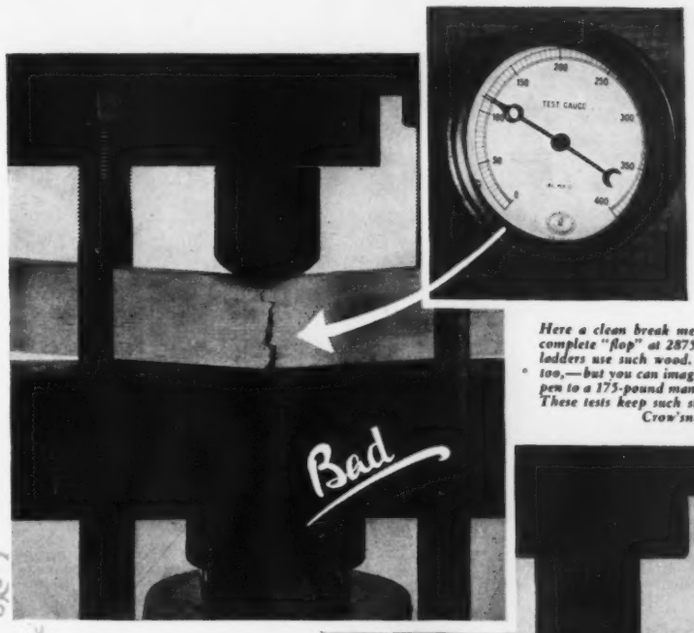
UNretouched PHOTOGRAPHS PROVE *the* WOOD *is* GOOD

—and what this means to you

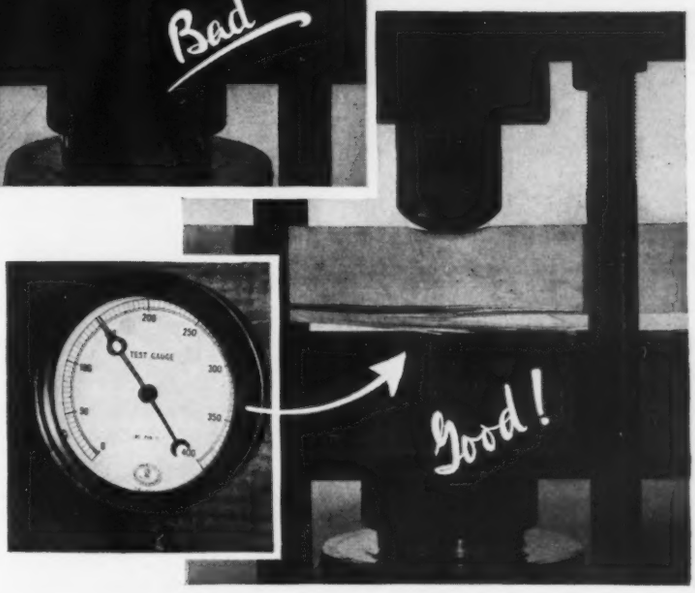
STRONG? No sidesway here. Both wood *and* construction see to that. Actually, the Murray Crow's-nest is a stiff truss.

Side members are Sitka spruce—the finest we can buy—tested carefully by the supplier—and then we test it. (See the pictures.) Any length that fails to meet U. S. Army and Navy Specifications—or that has *any* knots, or checks, or any change in grain direction more than once in 15 inches, is REJECTED!

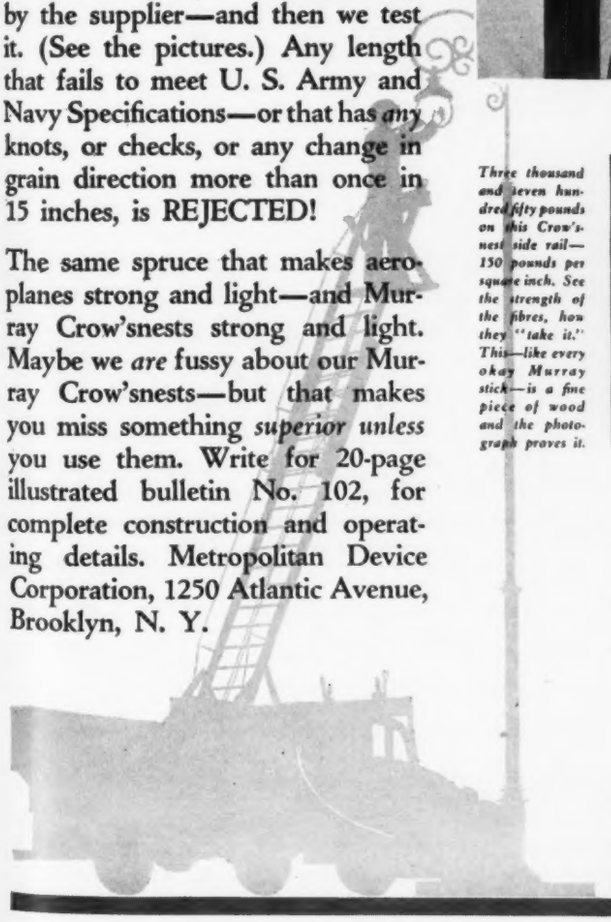
The same spruce that makes aeroplanes strong and light—and Murray Crow'snests strong and light. Maybe we *are* fussy about our Murray Crow'snests—but that makes you miss something *superior unless* you use them. Write for 20-page illustrated bulletin No. 102, for complete construction and operating details. Metropolitan Device Corporation, 1250 Atlantic Avenue, Brooklyn, N. Y.



Here a clean break means a bad stick—a complete "flop" at 2875 pounds! "Cheap" ladders use such wood. It is Sitka spruce, too,—but you can imagine what might happen to a 175-pound man in a 30-mile breeze. These tests keep such sticks out of Murray Crow'snests!

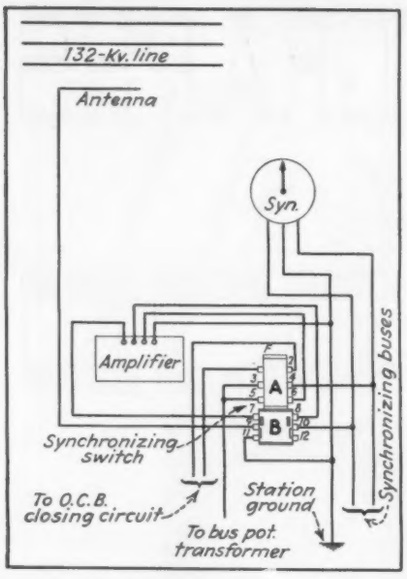


Three thousand and seven hundred fifty pounds on this Crow's-nest side rail—150 pounds per square inch. See the strength of the fibres, how they "take it." This—like every okay Murray stick—is a fine piece of wood and the photograph proves it.



SAFER • FASTER • MORE PRODUCTIVE

MURRAY CROW'NEST



Vacuum tube amplifier used instead of potential transformer to drive synchroscope

Section A of the synchronizing switch, containing contacts 1 to 6, is operated by a plug inserted at F and turned 90 deg. to complete circuits 1-2, 3-4, 5-6. Contacts 1-2 are in series with the O.C.B. closing switch and prevent the breaker from being closed improperly. Contacts 3-4 connect the bus potential transformer to one side of the synchroscope. Contacts 5-6 connect the bus potential transformer to the power supply of the amplifier. Auxiliary switch B having contacts 7-12 is a rotary double-pole, double throw, made especially for the purpose. Contact 9 grounds the antenna through contact 11 when the switch is in the "off" position and connects the antenna to the output of the amplifier through 7 when in use. Contacts 8-10 connect the amplifier output to the synchroscope.

amplifier well below its maximum output. Amplifier power supply is fed from a station bus potential transformer. All capacitors used in the design are paper dielectric. Standard radio parts are used throughout. Maintenance consists of turning the amplifier on once a week to see that it brings the synchroscope in-phase position.

Operation of synchronizing with this arrangement is identical with that of any of the other switches, with the exception that the amplifier requires fifteen seconds to warm up before it starts operating. A double-pole, double-throw rotary switch fastened to the synchronizing receptacle and operated by a pin in the end of the synchronizing plug turns amplifier on and off and grounds the antenna in the off position.

•

Explosions in Hospital Operating Rooms

Cases of ignition of anaesthetic vapors have occurred in hospitals which it has been difficult to account for except as a result of a spark due to unsuspected static electrification of the equipment used in operating room, according to a paper by E. H. Rayner before the I.E.E. (London). Tests carried out in various hospitals seem to indicate that such sparks are due to the use of oxygen at high pressure.

•

Chart Computes Drop in 3-Phase Feeders

By LEONARD H. GUSSOW
Electrical Engineer
Parkside Architectural Associates,
Detroit, Mich.

A monogram that offers a quick, accurate method for making the necessary computations in connection with the design of distribution feeders for residential building or groups of buildings is shown herewith. It is based on data issued to electrical engineers engaged in government housing projects by the U.S.H.A. and represents a graphical solution of the equation

$$V = FLA/1{,}000$$

where V is the voltage drop, L the length of feeder between the two points considered, A the line current in amperes, and F a factor based on resistance and reactance of the wire as given in the following table:

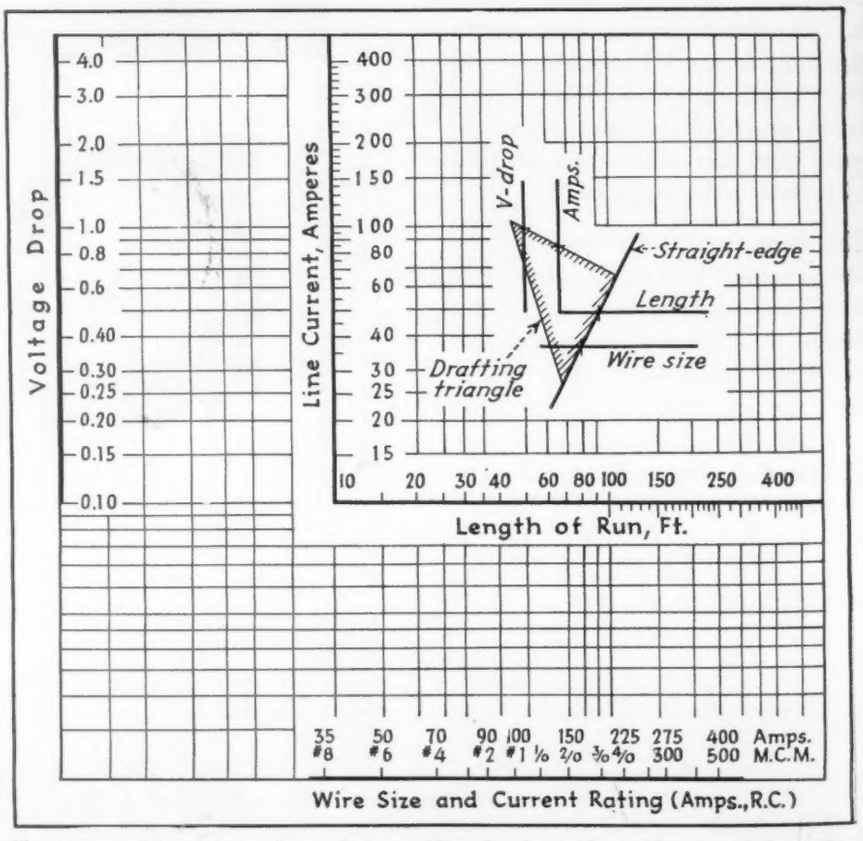
Wire Size No.	Factor F	Wire Size No.	Factor F
8	1.090	2/0	0.143
6	0.680	3/0	0.108
4	0.430	4/0	0.089
3	0.340	250 MCM	0.073
2	0.280	300 MCM	0.063
1	0.223	400 MCM	0.049
1/0	0.180	500 MCM	0.041

The constants and the chart are applicable to three-phase, 60-cycle, three-wire and four-wire systems with balanced load.

To use the chart, knowing the size of wire, the length of run and the amperes flowing, place a *straight edge* so as to intersect the known values of wire size and length. Slide a *drafting triangle* along this straight edge, as shown in the insert, until its perpendicular edge intersects the known current. The resultant voltage drop can then be read on the voltage drop scale. For example, using No. 1 wire with a run of 100 ft. and 90 amp. in the line the voltage drop as read is 2 volts.

When the size of the wire is to be determined, as is often the case, the maximum permissible voltage drop must be used.

In this case place the straight edge so as to intersect the known values of line current and permissible drop. Slide the triangle along the straight edge until the perpendicular intersects the known length of run. The wire size will then be taken as the size to the right of the point of intersection of the triangle edge on the wire size scale, providing, of course, that this wire size has sufficient current rating. To determine the exact voltage drop the process first explained must then be gone through.



Nomogram determines voltage drop in 60-cycle, three-phase, three- and four-wire feeders with balanced load

COSTS GO DOWN *when Hemingrays* GO UP!

3 SIZES

TYPE 660 . . . FOR VOLTAGES UP TO 8,000
TYPE 670 . . . FOR VOLTAGES UP TO 10,000
TYPE 680 . . . FOR VOLTAGES UP TO 15,000

Handle most PRIMARY line requirements

● There's no doubt about it! The modern design of the Series-600 HEMINGRAY Insulators provides the greater leakage distance that assures outage-free performance at all times. The brass bushing means greater mechanical strength. . . . The tougher glass defies age and offers resistance to harder usage. The more accurately controlled manufacturing processes mean uniform production. These four advantages added together mean unfailing service, lower costs throughout the years. . . Send today for test samples. Prove to yourself, as others have, the many HEMINGRAY advantages. . . Owens-Illinois Glass Company, Hemingray Division, Muncie, Indiana.

● World's largest manufacturers of glass containers; and producers of INSULUX Glass Block, DUST-STOP Replacement-Type Air Filters; FIBERGLAS Insulating Wool, Insulating Blankets and Electrical Insulation.

HEMINGRAY INSULATORS

OWENS-ILLINOIS GLASS COMPANY

"First in Glass"

Building Up THE LOAD

New ideas and practices in selling electrical equipment and service to commercial and domestic customers

Light Increases Used Car Sales

By ROBERT W. BROWN
Lighting Division,
Cincinnati Gas & Electric Company

Progressive used car dealers have realized that, in order to increase sales, automobiles must be brilliantly illuminated at night. Since the evening hours are the logical ones to sell cars, because of the greater volume of prospects which may be attracted at this time, it follows that good lighting is not only desirable but a necessity.

The Glenway Chevrolet Company of Cincinnati has solved its lighting problem by installing five 1,500-watt and two 750-watt open type reflectors which emphasize the highlights on the cars, making them more attractive at night than in daylight.

The sales office adds a modern touch through the use of a dark blue silhouette letter sign against a white background, which is very effective in daytime as well as after dark. This sign is lighted by a trough of twenty-five 25-watt lamps on 12-in. centers.

The large pylon sign is in red neon and is wedge-shaped, so that it is readable from almost any angle.

•

Tangible Benefits in House Service?

Is a home service department simply to be considered as an expensive adjunct to a commercial department or can its maintenance be justified from a revenue and goodwill standpoint? To find the answer to that problem B. C. Electric Railway Company, Ltd., Vancouver, made a thorough analysis of the operation of its home service department for 1937 and arrived at the conclusion that the company received tangible benefits far in excess of the cost of providing a capable staff of women demonstrators.

Records showed that the department created a total of $19,650 in immediate business—$9,735 in merchandise sales and $9,915 in annual revenue—and at the same time made a total of 17,000 customer contacts during the year. A total of 450,715 watts of new load was added. Based on 1,353 demonstrations conducted the revenue earned by the department averaged as follows:

	Per Demonstration
Immediate load added, watts	333
Prospective load, watts	106
Immediate annual revenue	$7.33
Merchandise sales	$7.04
Total value	$14.37

A breakdown of the 17,000 customer contacts made by the department emphasized the goodwill building value of the department. The contacts consisted of the following:

6,103 telephone inquiries answered.
1,922 persons interviewed in office.
7,073 persons attended teas and group demonstrations.
7,942 bulletins issued.
998 refrigerator demonstrations conducted.
587 electric range demonstrations conducted.
441 gas range demonstrations conducted.
230 electric range complaints answered.
131 gas range complaints answered.
662 telephone contacts on range operation.
32 telephone contacts on refrigerator operation.
500 lighting prospects submitted.
1,500 appliance prospects submitted.
120 kitchen plans prepared.

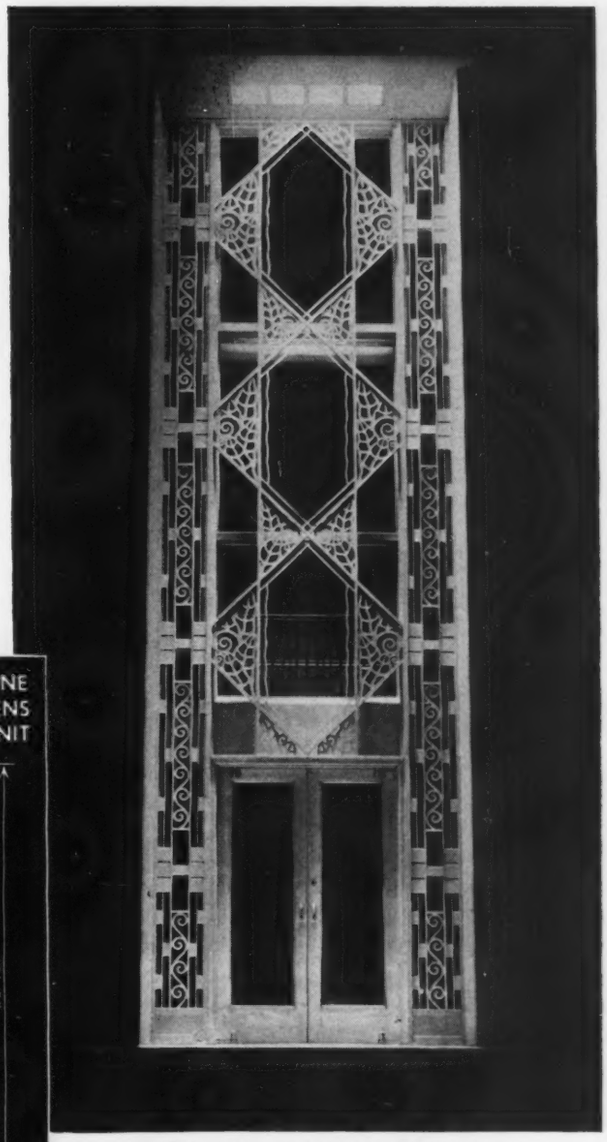
Experience of this company has indicated that mature women make the best home service workers. These are preferable to reduce turnover in the staff which is both wasteful and costly, and also because their work and comments register more effectively with the customer.

Cincinnati Gas & Electric Company's lighting division laid out this installation, using 9 kw. of open type reflectors

Architectural Beauty revealed by

CONTROLENS

(A product of Holophane Research)



Installation at Kenmore Municipal Building, Kenmore, N. Y. Architects: Green and James, Buffalo, N. Y. Consulting Engineers: Beman and Candee, Buffalo, N. Y.

THE PROBLEM: To light a three-story, ornamental grille from an "impossible" location.

THE SOLUTION: CONTROLENS In-Bilt lighting produces a precision sheet of light sweeping the screen uniformly from top to bottom with accurate lateral control to prevent distraction by adjacent architectural detail.

Section Through Entrance

CONTROLENS does more than enable the lighting engineer to bring about "better light—better sight"—it enables him to make lighting serve the beauty of the architect's design.

It is true that CONTROLENS gives you amazing light control: you can concentrate the light in some areas, spread it in others; you can build up illumination intensities in some locations and lower them in others—as you desire. But more than that—you can make lighting an integral part of the architect's design—for CONTROLENS is In-Bilt. You can treat it as a structural element; use it in wall or ceiling; conceal it or make it suitably visible (see illustration below).

CONTROLENS is made only by Holophane—the result of 40 years of experience in controlling light to serve industry and art.

Complete information is available to you without cost or obligation. Address:

HOLOPHANE

Engineering Service

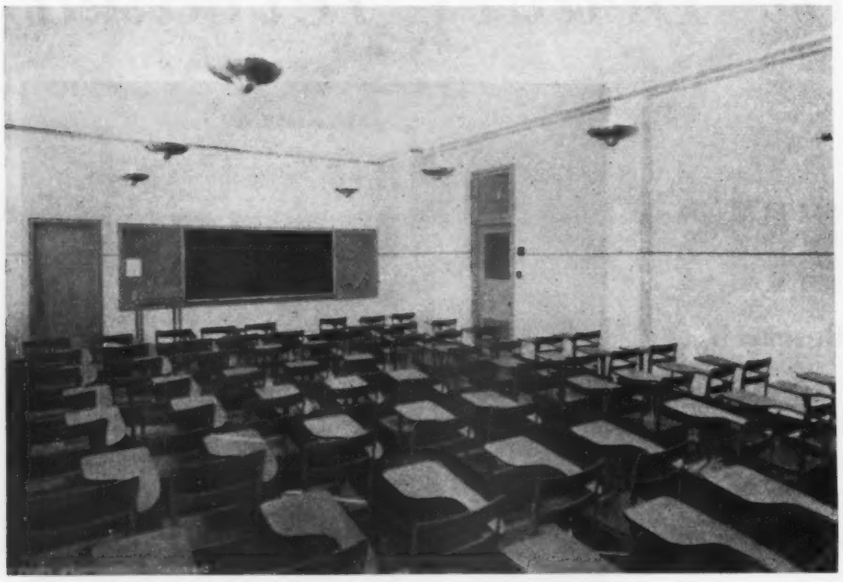
342 Madison Avenue • New York, N. Y.

THE HOLOPHANE COMPANY, LTD., 385 YONGE ST., TORONTO, CANADA

Information on the CONTROLENS also may be had by applying to any one of the following:

Day-Brite Lighting, Inc.	St. Louis, Mo.
Garden City Plating & Mfg. Co.	Chicago, Ill.
Erikson Electric Co.	Boston, Mass.
Frink Corporation	Long Island City, N. Y.
Major Equipment Co.	Chicago, Ill.
Mitchell Vance Co.	New York City
Edward F. Caldwell	New York City

OPTOMETRIC COLLEGE SETS LIGHT EXAMPLE



Latest practice and recommendations for schoolroom lighting were followed in the Northern Illinois College of Optometry in Chicago. In 1937 alone in this city 621 classrooms in public, private and parochial schools were equipped with modern standard lighting.

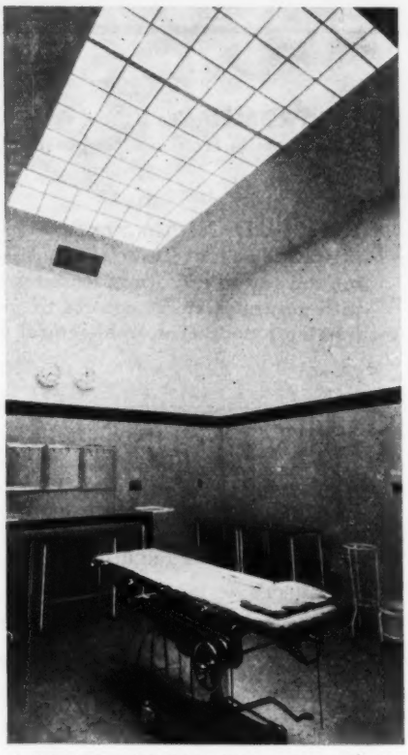
Package Unit Sells Window Lighting

By T. E. ROCHE
Division Lighting Engineer, Interstate Power Company, Albert Lea, Minn.

Big problem in selling lighting to the average small town merchant is how to overcome the owner's feeling that he cannot afford good lighting in his store and show window and that cutting down on the electric bill is an easy way to save money. This is the condition we found in the 150 small towns served by the Interstate Power Company in the southern part of Minnesota, where many of the merchants are still in the "60-watt bare lamp and drop cord" stage. These small town merchants were still back in the very earliest beginnings of store lighting. Selling modern store lighting to these prospects was a tough job.

Was a tough job, but is a lot easier one now. The solution was found in a commercially available low-cost packaged assembly of three 150-watt reflector units complete with brackets and other hardware that could be installed quickly in almost any store window. The procedure is to obtain permission from one merchant in a town to put one of the assemblies in his window at no cost to him on a "take it out if you don't like it" understanding. In most cases the demonstrators have stuck, have inspired improved window lighting by other merchants and have frequently been the entering wedge for better illumination inside the stores. After the first demonstrator installations, local electrical contractors have capitalized on the interest and are getting work and profit from it.

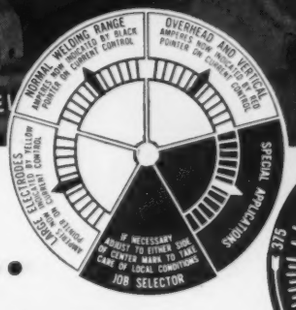
In the twelve months since the window lighting assemblies have been used as ice breakers 56 of them, through the efforts of only one salesman, have been installed and 51 have remained. In twenty stores they have been the direct cause for improvement in interior lighting. A fair estimation would be that in addition to the 34 kw. of their own added load the assemblies have been instrumental in putting 18 kw. of new commercial lighting load on the system.



AVERAGE INTENSITY 1,000 FOOT-CANDLES—Load possibilities of hospitals are indicated by this installation—one of six—at Buffalo (N. Y.) General Hospital. One thousand foot-candles of intensity is provided 6 in. above the table by 4,200 watts installed in Holophane MCLS operating room system

Before and after

Small town drug store window lighting pepped up by installations of three lamp package units. The six 150-watt lamps in the two units—one in each window—replaced two 50-watt, also one in each window.



EASY...QUICK...POSITIVE...

JOB SELECTOR and CURRENT CONTROL of the NEW "*SHIELD-ARC*" are *Self-Indicating*

● We don't claim that a 7-year-old can weld . . . that takes experience and skill . . . but we do say that your 7-year-old "helper" can set the New *"Shield-Arc"* because its "Job Selector" and Current Control are Self-Indicating. You get quickly the "bull's eye" setting for any TYPE of arc and any number of AMPERES . . . for maximum welding speed and quality every time.

This New Lincoln Welder also brings you:

DUAL CONTINUOUS CONTROL, providing literally thousands of combinations of voltage and current over an exceptionally wide range.

SELF-PROTECTED MOTOR (will not burn out), permitting the use of larger electrodes for 15% to 20% faster welding.

INDEPENDENT EXCITATION, for a steady arc under all welding conditions. Minimizes spatter.

LAMINATED MAGNETIC CIRCUIT, contributing to arc stability and welding range.

. . . and 25 other cost-cutting features. Consult the nearest Lincoln office or mail the coupon.

LINCOLN

LARGEST MANUFACTURERS OF ARC WELDING EQUIPMENT IN THE WORLD

THE LINCOLN ELECTRIC CO., Dept. U-543, Cleveland, O.

☐ Have a Lincoln man call to explain the new Self-Indicating *"Shield-Arc."* ☐ Send free bulletin.

Name _____ Position _____

Company _____

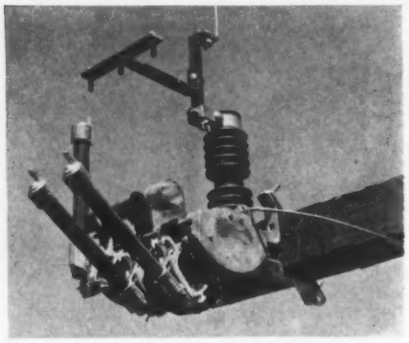
Address _____

City _____ State _____

New EQUIPMENT AVAILABLE

Repeating Fused Gaps

New line of repeating fused gaps is offered for use at important switching centers to reduce circuit breaker operations, effecting savings in inspection and maintenance costs. Three fuse cartridges are in series with air gap. Surges which break across the gap travel over the fuse link and are grounded almost instantaneously. Follow-up current, which blows the fuse link, is extinguished in the fibre tube, before the circuit breakers trip. Tension released when the fuse blows causes cartridge to "trip-out" of the circuit, indicating an operation. Repeating or reclosing action is provided by spring-and-lever mechanism.

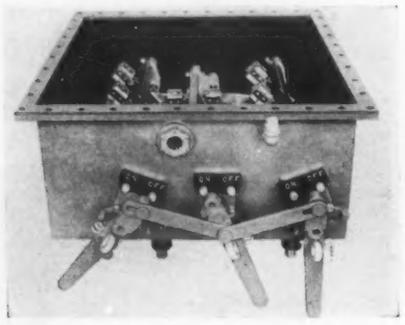


Repeating fused gaps; for pole or crossarm mounting in ratings 5 through 23 kv., channel-base mounted in sizes 7.5 through 69 kv. **James R. Kearney Corp.**, St. Louis, Mo.

•

Oil Disconnect

A new form of oil disconnect has three sets of gang-operated disconnecting links inclosed in a compact tank which serves as a switching unit for by-passing voltage regulators. The two outer switching links connect the regulator leads to the line, the middle links closing the line for by-passing the regulators. Outer and middle links are interlocked mechanically and electrically.

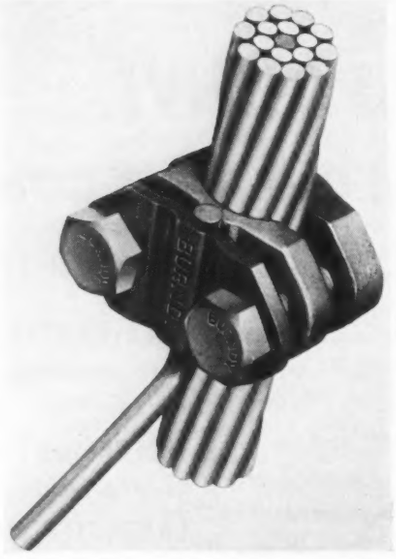


Type "RA" oil disconnect. **G & W Electric Specialty Co.**, Chicago, Ill.

•

Armor Rod Clamp

Especially adapted for taking copper and galvanized taps from A.C.S.R. over the armor rods, this new connector consists of three clamping elements held in place by two bolts and so arranged that the five parts constitute virtually a single piece, guarding against loss in transit. Design of clamp permits aluminum armor rods to bear against a galvanized surface and copper tap to bear against copper surface. Constant spring pressure is maintained between conductors, providing for a permanently secure installation.



Type "BPG" armor rod clamp. **Burndy Engineering Co., Inc.**, New York, N. Y.

•

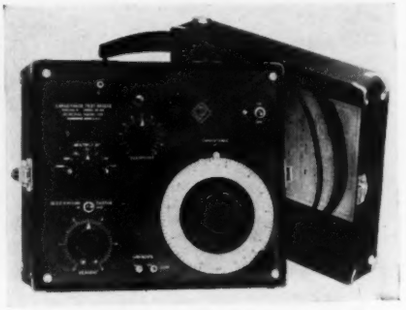
Lighting Equipment

Silvered-bowl diffuser, for use with 300- or 500-watt silvered bowl lamps; "WF-8 Aqualux" floodlights, for use with 250- or 400-watt projection or floodlight lamp. **Westinghouse Electric & Mfg. Co.**, Lighting Division, Cleveland, Ohio.

Two recent lighting developments by this company include (1) floodlights for underwater use in fountains, small pools, waterfalls and similar applications; (2) silvered-bowl diffuser for general lighting of low-bay areas in machine shops, assembly departments, metal working shops, printing shops, textile mills and similar locations. Diffuser unit consists of a dome-shaped, porcelain-enameled reflector, an inner Alzak-aluminum reflector and socket assembly.

Capacitance Bridge

Both accuracy and speed of routine laboratory and shop measurements of capacitance and power factor of insulator bushings, transformers, cables and assembled high-voltage insulators are said to be increased with this capacitance test bridge. It is also suggested for studying voltage distribution across multishell high-voltage insulators. Simple to operate, the instrument reads directly in capacitance and power factor, obtaining power from a 115-volt, 60-cycle line. Power input is 15 watts.



Type "740-B" capacitance test bridge; capacitance range, 5 m.mfd. to 1,100 mfd.; power factor range, 0 to 50 per cent. **General Radio Co.**, Cambridge, Mass.

•

Explosion-Proof Motors

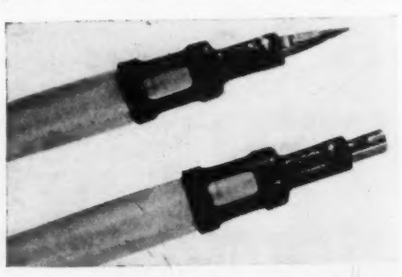
Type "QZX" explosion-proof motors, offered in N.E.M.A. frames. **Fairbanks, Morse & Co.**, Chicago, Ill.

Double-end ventilation features a new line of explosion-proof, ball-bearing motors, designed to guard against accidental ignition or explosion of vapors in Class I, Group D hazardous locations. This feature provides positive cooling from both ends of the motor, to eliminate "hot spots" and add to the life of the motor windings.

•

Pike Pole

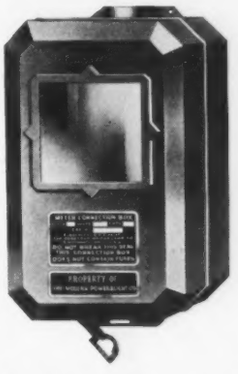
On this new pike pole a removable point is used; point is made in a separate



Pike pole. **A. B. Chance Co., Utilities Division**, Centralia, Mo.

RED INK on the balance sheet may get there through many causes, but one unfailing source of red ink is unchecked diversion of current. That diversion exists is no longer a debatable subject. That C-B equipment effectively terminates such losses is likewise undebatable—it has conclusively proved its value over and over in scores of thousands of installations.

Consult the C-B Technical Staff on the application of time-, labor- and money-saving C-B equipment to present or contemplated installations. This service is available to utility engineers without cost or obligation. Write today for details and bulletins 57, 58A, 60, 61, 62 and 63 for complete data on C-B Meter Test Devices; Meter Enclosures; Meter Service and Entrance Switches; Range and Water Heater Switches; Disconnect Switches; Meter Cabinets, and other products.



Ask for information about Corcoran-Brown facilities for the production of special equipment to meet your individual requirements.

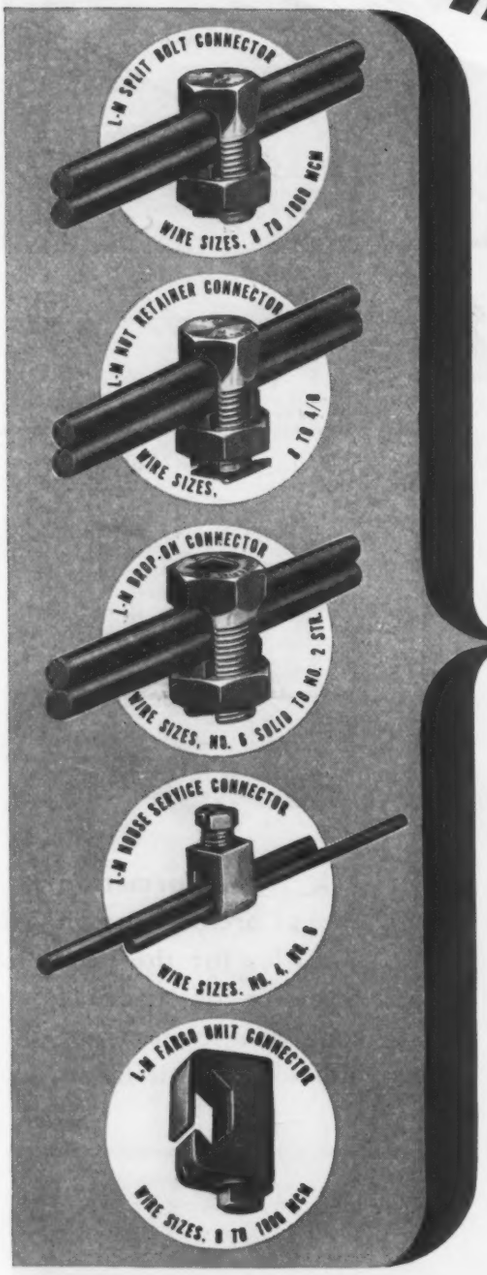
Electrical Department

CORCORAN-BROWN LAMP DIVISION

THE ELECTRIC AUTO-LITE COMPANY

4900 Spring Grove Avenue Cincinnati, Ohio

they KEEP their GRIP


L-M SPLIT BOLT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM
L-M NUT RETAINER CONNECTOR
WIRE SIZES, 8 TO 4/0
L-M DROP-ON CONNECTOR
WIRE SIZES, NO. 6 SOLID TO NO. 2 STR.
L-M HOUSE SERVICE CONNECTOR
WIRE SIZES, NO. 4, NO. 6
L-M FARGO UNIT CONNECTOR
WIRE SIZES, 8 TO 1000 MCM

L-M Connectors *hold* conductors in firm, perfect contacts while the years roll on. The extra strong bodies of L-M Connectors resist corrosion, refuse to bend under highest service pressures. Nuts run smoothly on their clean-cut threads after years of weather exposure. Wide, smooth contact surfaces insure high current carrying capacity and eliminate slippage. Ask your L-M representative about the complete line of L-M Connectors.

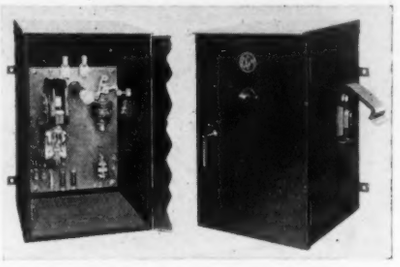
LINE MATERIAL CO.

piece, flat on one end and with a spiral point on the other. A spring catch on the side of the point holds it in place when it is slipped into the end of the ferrule on the pole. Advantages of this pike pole are that the point may be inserted in the ferrule point first for carrying on the truck, that the gimlet or spiral point holds without slipping, and that it is necessary only to replace the point when it becomes worn, rather than the entire pole.

•

Repeating Sectionalizer

Designed to isolate only part of a d.c. power system in the case of an overload or short circuit, this repeating sectionalizer consists of a magnetic contactor, an overload relay with ratchet lock-out feature and a timing circuit. Pressing the "on" button on the side of the inclosing cabinet



"Line-Arc" repeating sectionalizer; in various sizes to meet requirements of different capacities of power circuits. **The Electric Controller & Mfg. Co.**, Cleveland, Ohio.

closes the magnetic contactor and energizes the power circuit. On an overload or short circuit the overload relay trips and opens the contactor. After a two-second interval, contactor recloses. If the condition of overload still exists, contactor opens and automatically recloses after an interval of time, repeating this cycle until the number of overload relay trips as determined by the ratchet lock-out feature has been reached, when this device must be reset from the button on the side of the case.

•

Steel Conduit

A new development in protecting steel conduit from corrosion has been announced recently. By a process known as "Walker-

"Dualcote" conduit. **Walker Bros.**, Conshohocken, Pa.

izing," a uniform coating of zinc is fused into the outside and inside walls of the tube. Over this is applied a second coating containing a new, inert substance which offers strong resistance to acids, alkalis and salt water.

•

Pyrometer Potentiometer

Pyrometer-potentiometer. **The Lewis Engineering Co.**, Naugatuck, Conn.

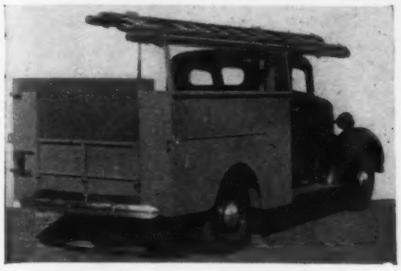
To extend the practicability of the potentiometer method of temperature measurement in the laboratory this company developed a new current standardizing device, called a "Thermo-Cell" and consisting of a heater and thermocouple in vacuum. The Thermo-Cell has a low internal resistance

and is said to be unaffected by a possible large current drain or by freezing. Stability and increased sensitivity are claimed for the galvanometer as a result.

•

Universal Utility Body

Designed for a variety of public utility uses, including meter installation, appliance repair and light line service, a new universal body makes use of a standard



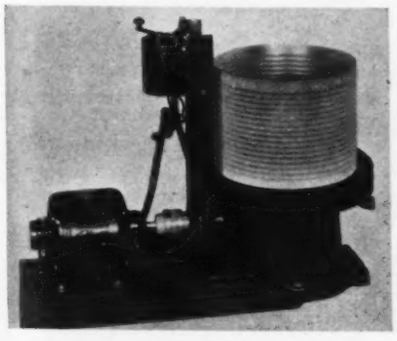
Type "4460" universal body; in 75 in. length for ½-ton chassis and 90 in. for ¾-ton chassis. **The American Coach & Body Co.**, Cleveland, Ohio.

shell which is manufactured on a production basis, to reduce body cost. It may be mounted on any make of chassis, it is said; while the compartments and shelves are installed at the factory, they are adjustable to special field requirements at the work. All-metal welded steel construction is used.

•

Electric Drying Unit

New construction in this dryer for centrifugal drying of metal products and parts includes a Garden City blower, direct-connected to a ¼-hp. motor. A 6-in. pipe line is welded to the cover and extends over the blower to a point where it can



"Mercil" type dryer. **Hanson - Van Winkle-Munning Co.**, Matawan, N. J.

swing out in a horizontal position. Cover is lifted and swung out of the way in order to load or unload the basket of work. Electric heating units are inserted in pipe line directly above opening in cover. This combination of dryer and electric drying unit is said to dry a batch of 30 to 60 lb. of small work in one or two minutes.

•

Portable Pyrometer

Built primarily for temperature measurements where a permanent installation is not needed, this portable indicating potentiometer pyrometer is said to be useful for testing and standardizing service instruments and thermocouples, for exploratory work and as a spare instrument. Compensation for cold-junction errors due to ambient temperature changes is pro-

A $500 FIRE LOSS

and the Comptroller's $19,000 Smile

(An actual incident)

The fire report states—"On April 1st a bolt broke from field coil strap on rotating field of 12,000 KVA, 13,200 V. synchronous condenser. Bolt got into stator windings, short circuiting two coils. Fire flashed.

"Differential relays took out the machine, operated LUX Extinguishing System. Inspection revealed that Lux *confined the fire damage to the two coils only.*

"Company has highest praise for operation of Lux System, stating that Lux has more than paid for itself."

Glance at the Savings

Actual damages were about $500 . . . loss of use, 4 days. Without instant control, fire damage might reasonably have been $19,500 . . . loss of use, 6 to 8 weeks.

The Company Comptroller smiles, "Lux saved $19,000 fire loss." Operating men say, "Lux saved at least 144 hours of service on that condenser."

Protect Capacity With LUX

Look at it any way you choose —Lux automatic fire protection offers impressive savings. Lux carbon dioxide gas is the *fastest* known extinguishing agent, *harmless* to the most delicate equipment—no wetting of insulation. Lux is non-freezing, non-deteriorating.

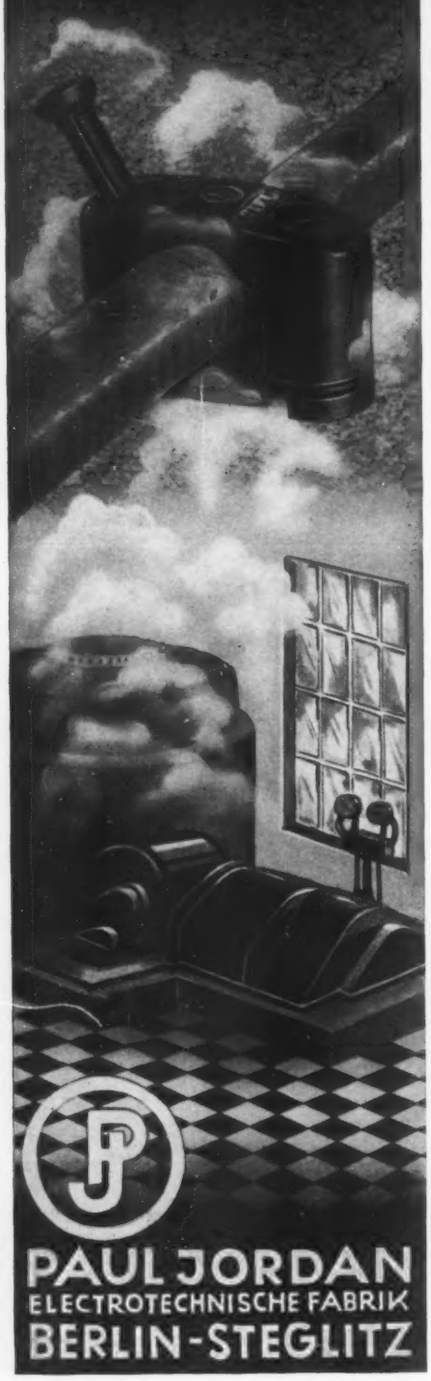
Fire protection is a problem in dollars and cents or in K.W.H. Plan on *Lux* protection for 1939. A fire can raise the devil with continuity of service.

WRITE FOR DESCRIPTIVE BROCHURE, "Lux Makes the Difference", explaining Lux automatic protection for central stations.

Walter Kidde & Company

50 West Street, Bloomfield, N. J.

GURO
KEY BOLT CLIPS
PAT. No. 2111289
A NEW MEANS FOR FIXING ELECTRIC WIRING
AWAY FROM THE WALL.
NON-RUSTING
ENTIRELY WITHOUT METAL,
EVEN WITHOUT METAL SCREWS.
A ONE-QUARTER TURN OF THE KEY BOLT CONNECTS
TOP AND BOTTOM PART.
RAPID FIXING.



PAUL JORDAN
ELECTROTECHNISCHE FABRIK
BERLIN-STEGLITZ

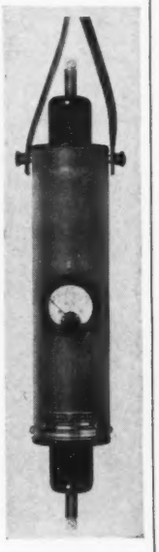
Model "8106"; 17-in. scale; single- and double-range instruments. **Foxboro Co.**, Foxboro, Mass.

vided by a cold-junction compensator coil. By reversing this coil the meter can be used as a source of emf. Vernier-type rheostat and dial are used.

•

New Instruments

Phasing-out voltmeter shown; a.c. and d.c. voltmeters, types "AP-9" and "DP-9" respectively; photo - electric galvanometer; inkless strip-chart recording instrument, all not pictured. **General Electric Co.**, Schenectady, N. Y.



Instrument developments announced by this company include: (1) Phasing-out voltmeters; (2) portable photo-electric contact-making galvanometer; (3) temperature-compensated voltmeters, a.c. and d.c.; (4) a recording instrument using a typewriter ribbon as the marking mechanism. The phasing-out voltmeter consists, basically, of a rectifier-type milliammeter connected in series with a small neon lamp and two high-voltage resistors, the component parts being housed in a transparent plastics tube. Instrument is insulated for 5,000 volts to ground and the neon lamp glows on all voltages above 110. Contacts of the contact-making galvanometer are rated at one amp., 115 volts for non-reactive circuits and the device operates from 60-cycle lighting circuits.

•

Furnace Pressure Control

"Air-o-Line" furnace pressure controller; pointer will move 10 per cent of range in one second, 100 per cent of total range in three seconds. **Brown Instrument Co.**, Philadelphia, Pa.

For the indication and control of low-range pressures and drafts, this new furnace pressure controller has been developed. Applicable for controlling pressure from minus 5 in. of water to plus 5 in. of water, the controller is an inverted-bell type draft indicator combined with the company's "Air-o-Line" control unit. Automatic reset and fully adjustable throttling range are designed to prevent the furnace pressure from lining out at some point other than the control point and to eliminate over-correcting and cycling.

From the viewpoint of every man concerned with line construction and maintenance, Chance Anchors are a sound investment.

To management they mean line security — protection for capital invested in line construction.

From the purchasing department Chance Anchors get first consideration for many reasons—quality, dependability, price, adaptability to various needs, integrity of the manufacturer, and delivery service.

To construction superintendents the Chance complete line provides the right anchor for every job—dependable, economical results.

The Engineer relies on fact, fact proven by test. He knows that every Chance Anchor will do the job for which it is made because it has been proven.

To the store keeper Chance Anchors mean a complete, all round, stock from a single source of supply; an anchor for every requirement and a stock easily checked by Chance metal tags.

The line foreman selects Chance Anchors because he can be assured of a job well done in minimum time.

To the lineman Chance Anchors represent a better job with less effort — an anchor to meet each specific requirement, easier installation, easier handling and better results.

Build Security into your lines. Select your anchors from the complete Chance line of 18 types and 75 sizes.

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Are a Part of The Purchasing Office

The new E. T. L. building is NEWS—since its interior arrangements have been designed to serve the modern trend—the new uses for investigations and tests —the new test factors in buying materials and products for resale—the new trend toward building sales with labeled merchandise—the group-purchasing trend in utility and department store merchandise. To provide for the latter, three of the full-daylight floors are rentable for purchasing offices with availability of the various laboratories for check against specifications and to predetermine service adequacy . . . . and in addition private laboratories are available for clients. A booklet on the new E. T. L. Building will be mailed you upon request.

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ELECTRICAL TESTING LABORATORIES

News ABOUT PEOPLE

Seybold Made Vice-President Wisconsin Electric Power

Lawrence F. Seybold, formerly assistant vice-president of the Milwaukee Electric Railway & Light Company, now named Wisconsin Electric Power Company, has been elected vice-president.

A native of Wisconsin and a graduate of the University of Wisconsin, Mr. Seybold affiliated himself with the Milwaukee utility in the spring of 1919, advancing from junior engineer in the operating research bureau to assistant research engineer in 1926. In 1929 he became research engineer and head of that bureau in charge of engineering and economic work related to the company's business, and in 1935 was appointed assistant vice-president.

Mr. Seybold has been active in committee work of the Wisconsin Utilities Association and in 1936 and 1937 served as chairman of its technical committee which prepared an extensive report covering the interconnection and co-ordination of the power generation and transmission facilities in the state of Wisconsin. Mr. Seybold has recently been active in financial, regulatory and tax problems of the company.

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▶ H. R. CRUMLEY has been appointed general superintendent of the Virginia Public Service Company at Charlottesville. A graduate of the Georgia School of Technology, Mr. Crumley became identified with the General Electric Company's test course at Schenectady following graduation. After a year he joined the Georgia Railway & Power Company. In 1926 he became relay engineer for the New Jersey Power & Light Company; one year later he was appointed assistant superintendent of operation, and in 1932 became chief system operator. He joined the E. M. Gilbert Engineering Corporation, Reading, Pa., as electrical engineer in 1937, and later became consulting engineer for the Utility Management Corporation, Reading.

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Haverhill Electric Names C. E. Haseltine Manager

Carroll E. Haseltine has been appointed manager of the Haverhill (Mass.) Electric Company, succeeding George W. Hurn, who has held that position since 1919. Mr. Haseltine is a native of Haverhill and entered the company's employ in 1906 as an office boy, later working in every major department. In 1928 he became assistant manager. The company is affiliated with the New England Power Association.

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▶ L. G. BREWER has been appointed assistant superintendent of distribution for the Montana Power Company at Great Falls. Mr. Brewer was formerly distribution engineer in the Havre offices of the company.

▶ K. L. HANSEN, since 1932 consulting engineer for the Harnischfeger Corporation, Milwaukee, has been elected a vice-president of the American Welding Society. Mr. Hansen has held various positions with the Western Electric Company, Commonwealth Edison Company, Westinghouse Electric & Manufacturing Company and the Louis Allis Company. He is a member of the electric welding committee of the American Institute of Electrical Engineers and is a past-chairman of the Institute's Milwaukee section.

W. T. Reace Named Manager, Merchandise Sales Division

Commonwealth Edison Company has announced that William T. Reace has been appointed manager of the merchandise sales division to succeed the late Gardner S. Howland. Mr. Reace

was formerly assistant manager of the division.

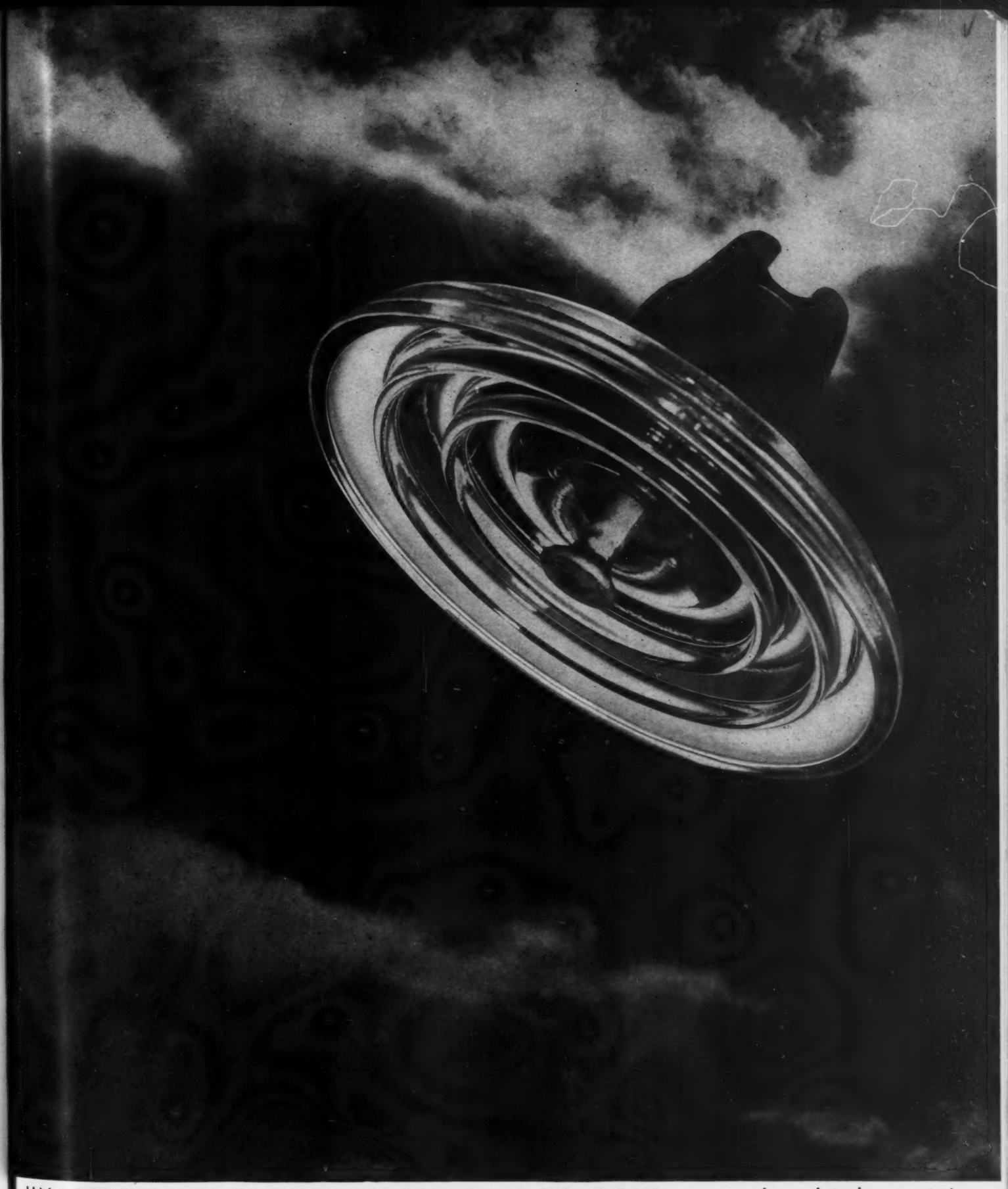
William R. Cannon, formerly assistant to the manager, has been named assistant manager to succeed Mr. Reace and L. F. Mahlke, moving up from supervisor of small appliance sales, has been selected to succeed Mr. Cannon.

Mr. Reace started as a house-to-house appliance salesman and in 1916 became a sign salesman, then served as a lighting salesman and industrial heating engineer and in 1928 was appointed supervisor of electric refrigeration sales. He became assistant manager, merchandise sales in 1936.

Mr. Cannon has been associated with the Commonwealth Edison since 1920 and Mr. Mahlke since 1928.

•

▶ STEPHEN P. DARLINGTON has been appointed electrical engineer in the PWA offices in Charleston, S. C., for the Santee-Cooper project. Mr. Darlington, formerly with the South Carolina Public Service Commission, is from Columbia, S. C. He worked on the Saluda



UNAFFECTED BY SUDDEN TEMPERATURE CHANGES...*another high spot in*

TODAY'S TREND TOWARD PYREX POWER INSULATORS

PYREX is a Trade Mark and indicates manufacture by Corning Glass Works, Corning, N. Y.

dam of Lake Murray. EDGAR B. MILLER was made mechanical engineer. He was transferred from the Tennessee Valley Authority.

▶ HARRY L. GARVER, rural electrification investigator at Washington State College, Pullman, Wash., for the past thirteen years, recently resigned to become research worker on rural electrification with the Bureau of Agricultural Engineering at Washington, D. C.

▶ E. K. HARTZELL, for 15 years general passenger agent of the old Lake Shore Electric Railway Company and now traffic manager for the Lake Shore Coach Company, its successor, has resigned to become executive assistant to the vice-president and general manager of the East Tennessee Light & Power Company at Bristol, Tenn.

▶ WALTER R. CHITTY, formerly local manager of the Sultan (Wash.) office of the Puget Sound Power & Light Company, has been appointed local manager of the Snohomish office to succeed Charles H. Gillespie, who, because of ill health, has undertaken duties of less arduous nature at Oak Harbor.

▶ CLEMENT SAY, secretary and treasurer of the Northern Electric Company, Ltd., Montreal, Que., has resigned. Mr. Say joined the Imperial Wire & Cable Company 35 years ago, and when that company was merged with the Northern Electric & Manufacturing Company under the name of Northern Electric Company, Ltd., in 1914, Mr. Say became its secreatry, and shortly thereafter its treasurer. W. E. MCBAIN has been appointed secretary and treasurer to succeed Mr. Say.

▶ R. J. STRITTMATTER has recently been appointed division sales manager of the Blackstone Manufacturing Company in the central midwest territory with offices in Cleveland, Ohio. Mr. Strittmatter has had many years experience in the promotion and sale of electrical appliances in all sections of the country. He was associated with the Apex Electrical Manufacturing Company for 22 years and for the past ten years he has served as vice-president in charge of sales.

▶ W. F. HESS has been elected a vice-president of the American Welding Society. Since 1938 Dr. Hess has been associate professor of metallurgical engineering at Rensselaer Polytechnic Institute.

▶ GEORGE LIBBEY, who has supervised the advertising and sales promotion activities on heating devices for the General Electric appliance and merchandising department, Bridgeport, Conn., for some time, has been transferred to the sales department as commercial representative for the west coast with headquarters in Ontario, Calif., where many G.E. heating devices are manufactured.

▶ E. L. WHITE, formerly communication engineer for the Puget Sound Power & Light Company, Seattle, Wash., is now employed on the Bonneville project, Portland, Ore.

▶ R. M. HENDERSON has been elected vice-president of United Engineers and Constructors, Inc., with offices in Chicago, Ill. Following a period as electrical engineer for the Mexican Central Railway during 1902–04, Mr. Henderson returned to the United States to become an engineer for the Arnold Company, Chicago. In 1907 he became affiliated with Stone & Webster, Inc., Boston, Mass., holding successively the positions of construction engineer, assistant construction manager and district manager in the Chicago offices. From 1918 to 1928 Mr. Henderson was a vice-president of Dwight P. Robinson & Company, Inc., New York. When that company was merged with other firms to form the United Engineers and Constructors, Inc., in 1928, Mr. Henderson was appointed president of the Canadian subsidiary corporation of the new organization. Since 1932 he has been midwest manager of the company.

▶ M. G. MARSHALL now is affiliated with the James R. Kearney Corporation, St. Louis, Mo. Formerly Mr. Marshall was an electrical engineer for the Commonwealth & Southern Corporation, Jackson, Mich.

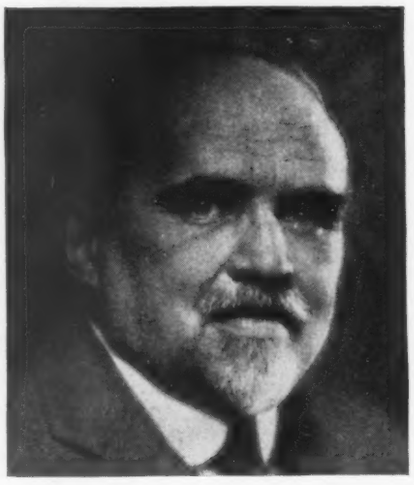
▶ F. J. ZAK has become superintendent of distribution for the Fredericksburg district of the Virginia Electric & Power Company. Mr. Zak has been system engineer in the Richmond offices of the company.

OBITUARY

W. S. Moody

Walter S. Moody, whose death was announced in the November 12 issue of ELECTRICAL WORLD, page 17, held front rank in transformer design for many years.

While acting as instructor at M.I.T. Mr. Moody met William Stanley and



became so impressed with his personality and with the possibilities of alternating current distribution of power that he forthwith made it his particular field of research.

In 1892 Mr. Moody joined the force of the Thomson-Houston Electric Company at Lynn, as designing engineer in transformers and alternating-current dynamos. He continued with Thomson-Houston as designing engineer until after the merger with the General Electric Company, when he became chief engineer of the transformer department of the latter company. He continued as chief engineer in Lynn until 1897, then moved to Schenectady, remaining until 1906 when he went to Pittsfield in charge of transformer engineering for the entire company, a position he held until made consulting engineer in 1927. He retired from active work in 1931.

Mr. Moody was especially known in the electrical industry for his work in connection with the so-called type H transformer, used extensively on poles for the distribution of electricity and for his air-blast transformer design. Equally as important was his pioneer work in the use of silicon sheet steel for transformers and other electrical equipment. Mr. Moody was one of the original members of the Pittsfield chapter of the American Institute of Electrical Engineers and became a fellow of that organization.

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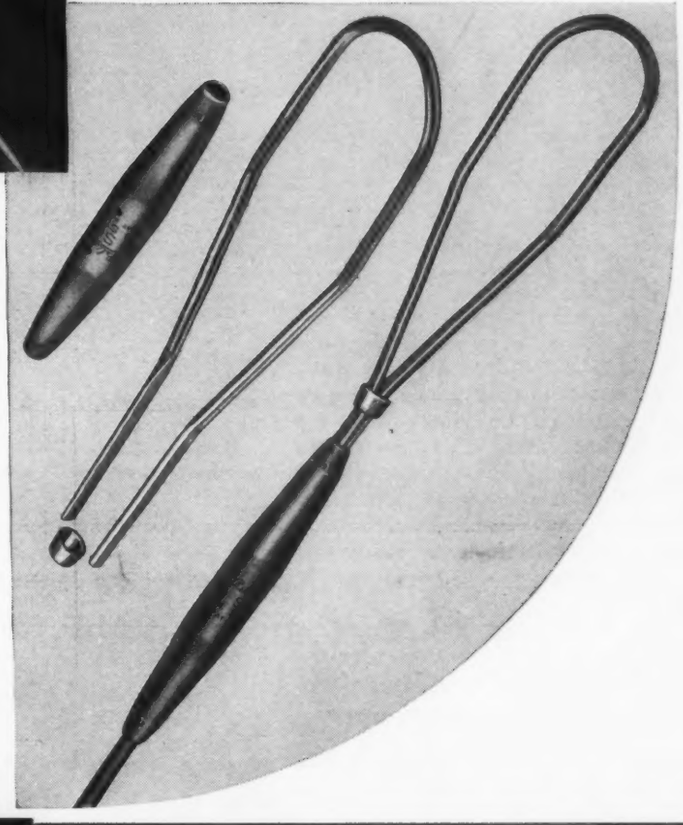
▶ FRANK L. BUTLER, vice-president of the Georgia Power Company in charge of transportation, died November 12, in his sixty-fifth year. Mr. Butler had been in poor health for the past few years. He had been associated with the Atlanta properties since 1921, when he became manager of the railway department of the Georgia Railway & Power Company, predecessor of Georgia Power Company. One year later he was made general operating manager in charge of the railway, electric, gas and steam-heating departments. In 1923 he was elected vice-president in charge of operation of Georgia Railway & Power. For three years previous to his connection with the Georgia company Mr. Butler was identified with the Winnipeg Electric Railway and was manager of that property when he resigned to go to Atlanta.

Reliable STRAIGHTLINE DEAD ENDS

FLEXIBLE CLEVIS TYPE

For use with Strain or Spool Insulators

- Made throughout of copper and high strength copper alloys.
- Very convenient to install.
- Neat and compact — easy to tape.
- Will hold full line strength.



Straight-Thru Type

Very convenient for pulling slack. A radically new design results in a compact bronze unit that is high in strength and low in cost. The parts latch into a one piece assembly for convenience in handling and take-up of slack.

Double "D" Type

Offers real economy in stocking. Permits dead ending with a standard Reliable Straightline Splice.

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OVER 25 YEARS SERVICE TO THE UTILITIES
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Write for Bulletin

Manufacturing AND MARKETS

Refrigerator Sales Drop in September

Domestic sales of electric household refrigerators during the month of September totaled 57,985 units, compared with 86,729 units in August and 76,905 units in September, 1937, according to a report issued by the National Electrical Manufacturers Association, based on returns from seventeen companies. For the nine-month period ended September 30 domestic sales amounted to 1,085,221 units, compared with 1,954,880 units for the similar period of 1937.

World sales in September totaled 72,050 units, compared with 100,144 units in August, and 87,842 units in September, 1937. For the nine-month period world sales amounted to 1,221,871 units, compared with 2,116,612 for the similar period of 1937.

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Bessemer Awards Contract

City Council, Bessemer, Ala., has awarded contract to the Federal Engineering Construction Company, Kansas City, Mo., for construction of a transmission line from city limits to Fulton Springs, Ala., where connection will be made with TVA power lines from Guntersville, Ala., hydro-electric generating station. A new power substation for step-down service will be built at Fulton Springs, and distribution power substation will be located in Bessemer.

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Orders for Air Conditioning Continue Off in September

Orders booked for air conditioning systems and equipment during September, as reported by 125 manufacturers, totaled $3,052,460, as against $3,220,906 in August and $3,910,932 in September last year, according to the Department of Commerce. For the first nine months, orders were $31,067,879, as compared with $52,259,868 in the same period a year ago.

Of the total orders booked for September, orders by the air conditioning group of manufacturers amounted to $1,267,009 against $1,292,985 in August and $1,194,296 in September a year ago. Orders by the fan group were $977,475 against $1,285,469 and $1,508,648; those by the unit heater group were $807,976 against $642,452 and $1,207,988.

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Manufacturers Issue Earnings Statements

Among the earnings reports recently issued covering the September quarter are the following:

NATIONAL POLE AND TREATING—Nine months to September 30: Net loss, $104,656, compared with one of $22,222 last year. September quarter: Net loss, $18,913, against $64,986 loss in June quarter and $15,049 loss in September quarter a year ago.

EUREKA VACUUM CLEANER—Nine months ended September 30: Net loss, $235,369, contrasted with net profit last year of $53,179, equal to 22 cents each on 240,395 shares. September quarter: Net loss, $86,349, against $80,806 loss in June quarter and $50,525 loss in September quarter of 1937.

MAYTAG—September quarter: Net profit, $236,327; equal, after dividend requirements on 38,000 shares of no-par $6 first preferred stock, to 63 cents each on 285,000 shares of $3 preference stock. This contrasted with net loss of $2,495 in June quarter this year and net profit of $643,202, or 23 cents each, on 1,617,922 common shares in the September quarter of 1937, after dividend requirements on the $6 preferred and $3 preference stocks. Nine months to September 30: Net profit, $322,155; equal, after first preferred dividend requirements, to 53 cents each on $3 preference stock, compared with $1,948,471, equal after dividend requirements on preferred and preference stocks, to 70 cents a common share for the nine-month period last year.

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Spokane Dealers Organize

Spokane electrical appliance dealers for the first time have formed an organization under the name Electrical Wholesalers and Retailers Association. E. Bergquist was elected president.

I. T. & T. Unit to Sell Electric Appliances

Manufacturing and sales companies of the International Telephone & Telegraph Corporation abroad have entered the electric household refrigerator field as a result of a long-term contract arranged between International Standard Electric Corporation, which manages the greater part of I. T. & T.'s manufacturing and sales activities throughout the world, and the Gibson Refrigerator Company of Greenville, Mich.

Under the contract International Standard Electric acquires sales and manufacturing rights in foreign countries to certain of Gibson's products as well as technical advice and assistance to enable I. T. & T. factories to manufacture household refrigeration products in foreign countries under their own trade marks and trade names.

The arrangement gives Gibson a potential sales outlet in almost every country in the world outside of the United States and Canada, and for I. T. & T. it marks an important step in its policy of diversifying its line of manufactured products.

•

Exports Hit Lowest Level in Two Years

United States exports of electrical equipment, which amounted to $7,925,590 during the month of September, represented a decline of $834,790, or 9.5 per cent, from the preceding month's figure of $8,760,380, according to the electrical division, Bureau of Foreign and Domestic Commerce.

September exports reached the lowest level recorded for any month during the last two years. In fact, exports for the first nine months of 1938 barely exceeded the exports for the first eight months of 1937.

With a few exceptions, the decline was general. Among the exceptions were "industrial furnaces, ovens and other heating devices," which showed better than a 100 per cent increase

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the greatest single achievement, the most sweeping advance ever made in methods of reproducing technical drawings—Ozalid's New Automatic White Print Machines

These amazing new machines will be demonstrated *for the first time* at the Power Show. Be sure to see them—Booths 237, 238, and 239. Or, if you cannot attend the Power Show, write for complete information about these latest Ozalid Machines, which will revolutionize present print making practices

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over August sales. Household refrigerators, washing machines and radio receiving sets all recorded smaller gains, according to the Commerce Department.

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Manufacturers Make Pact on Electric Capacitors

Announcement has been made by Octave Blake, Jr., president of Cornell-Dubilier Electric Corporation, and H. M. Pease, vice-president International Standard Electric Corporation, of an agreement reached between their respective companies.

Under the terms of the contract, the assistance of the engineering, manufacing and commercial divisions of Cornell-Dubilier for the production and sale of electric capacitors becomes available to the International Standard Electric through its following affiliated manufacturing companies abroad: Le Materiel Telephonique, Boulogne-Billancourt, France; Bell Telephone Manufacturing Company, Berne, Switzerland; Standard Telephone und Radio A. G. Zurich, Switzerland, and Bell Telephone Manufacturing Company, Antwerp, Belgium.

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All-American Canal Bids

The Bureau of Reclamation, Denver. Colo., is completing plans and will take bids soon for various equipment required for power development on the All-American Canal, including power plant at Drop No. 4. The Bureau also has surveys and preliminary plans under way for new power dam and hydroelectric generating station at Twin Springs, Idaho, for Boise project.

•

New Line to Cost $79,660

The Lower Colorado River Authority has awarded contract to Fritz Ziebarth, Inc., Long Beach, Calif., for construction of new 138-kv. transmission line from Buchanan Dam, on lower Colorado River, to Marshall Ford, Tex., a distance of about 39.6 miles, at price of $79,660. Work is scheduled to be placed under way at once.

New York Metal Prices

	Nov. 8, 1938 Cents per Pound	Nov. 15, 1938 Cents per Pound
Copper electrolytic	11.25*	11.25*
Lead Am. S. & R. price	5.10	5.10
Antimony	12.25	12.25
Nickel ingot	35.00	35.00
Zinc spot	5.44	5.44
Tin straits	46.25	46.625
Aluminum, 99 per cent	20.00	20.00

* Delivered Connecticut Valley.

Field Reports on Business

Business sentiment has taken a turn for the better following the election of last week. Orders have shown signs of greater expansion. Demands for new automobiles are above a year ago. Based upon the continued rise in power production, utility earnings are tending upward.

NEW YORK

Business in practically every line is showing further signs of expanding activity, with prospects that the upturn will continue for some time. Sentiment among industrial leaders has been greatly buoyed since the election last week, in which voters showed preference to conservatives.

The automobile show here this week has brought out a large number of buyers, many with cash on delivery. The industry feels that sales during the next twelve months will exceed 1938 totals. The high rate of automobile production has upped steel output. Other industries are feeling the push.

In the utility field work is being concentrated on integration plans. Construction budgets are receiving more thought. Manufacturers are pleased with the prospects of better business as inquiries continue on the upturn.

An encouraging sign for the utilities is seen in the high rate of power production. Earnings of utilities are expected to make a good showing in the fourth quarter as compared with the three previous ones and with the last one of 1937. Interest in utility securities has become more pronounced of late, with bankers indicating that investor demands will be such as to reopen the new capital market. Most utility financing during the past few years has been of a refunding nature.

PACIFIC COAST

California reacted promptly to decisive defeat of destructive single tax and pension proposals at the November election and wholesalers report a healthier attitude by both dealers and contractors. Holiday shopping throughout the western area is beginning unusually early and electrical appliances, particularly medium-priced table varieties, are apparently set for a good year. They have been selling steadily even in San Francisco during the recent retail strike.

Efforts to revive the Pacific Coast shipping industry are reflected in an $892,000 contract for a government survey vessel to a Seattle firm and Bethlehem's bid of $52,-145,000 for three battleships, including their machinery. Considerable electrical reconditioning of the Dollar Line fleet is expected.

Recent orders from various branches of the industry have included 10 miles of size No. 3/0 round trolley wire, $15,000 voltage regulator equipment for Moccasin power house, $5,000 R. C. cable by Oakland and a $35,650 REA contract for 48 miles in Yakima and Benton counties, Washington. Award will be made about December 1 for 667- and 833-kva. transformers, circuit breakers, and disconnect switches for the Big Thompson project in Colorado and three turbo-alternators, value $400,000, for Navy base at Pearl Harbor, Hawaiian Islands.

A municipal power plant costing $120,-000 with PWA aid is proposed for Truckee, Calif. October building permits for seven Western states totaled $26,615,439, an increase of nearly 60 per cent over October, 1937, when the building curve was dipping sharply, and of 10 per cent over October, 1936, when it was rising to the 1937 spring peak. Credit conditions are fair and collections are shading a forty-day average due to vigorous and sustained supervision.

NEW ENGLAND

Industry's buoyant reaction to the election results presages a healthy development of capital goods markets and more active modernization of factories in this area. Automotive industry expansion is stimulating production in metal-working and textile plants. The trend of electrical output in this district is ahead of last year.

Slight but steady gains in the volume of industrial electrical equipment is reported by manufacturers and inquiries are gaining. During the past week motors aggregating 150 hp. were purchased by a Connecticut machine manufacturer; a small lot of motors rated at 5 hp. and under were sold by another prominent manufacturer. One institution recently purchased more than 60 hp. in motors for supplying additional power to its shops and small motors involving more than 100 hp. are being considered in plans for institutions which demand installations of ventilating and air-conditioning service.

Small switch and control apparatus orders show an encouraging trend. Recently a number of special recording control and regulating equipment orders were received by one well-known company. General supplies for WPA projects are moving well in this district. More than 25 miles of wire is required for a Massachusetts project; pole line materials are moving well.

Industrial electric heating interest is gaining. More than 5,000 kw. is projected for new metal heat-treating furnaces in this area. Recently commercial electric cooking apparatus totaling over 110 kw. was placed in the Boston district. Merchandising is gaining, with the demand strong for minor domestic appliances and radio sets.

CHICAGO

Sentiment was more optimistic than at any time in over a year as business activity continued the upward trend. Most lines advanced to a new high point for the year, with many operating at a pace sufficient to surpass last year's level. Electrical power output showed a gain over the previous week and the corresponding period of 1937.

Industrial production expanded further and slight gains were registered in employment and payrolls. Activity in the steel mills continued to rise as increased automobile production raised the demand for raw material. Industrial building received added impetus as construction of several factory building was announced, which will involve an expenditure of approximately $5,000,000.

The city will spend $271,000 for new lighting equipment on 33 miles of streets. Industrial lighting sales are making steady gains. One order received last week included 600 porcelain enameled reflectors. A substantial order was given for early delivery of vertical lift switchgears. PWA awards for electrical work in school remodeling totaled $225,000.

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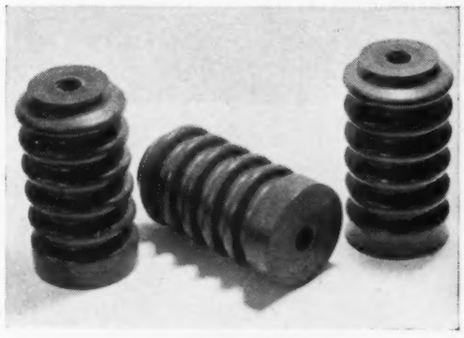
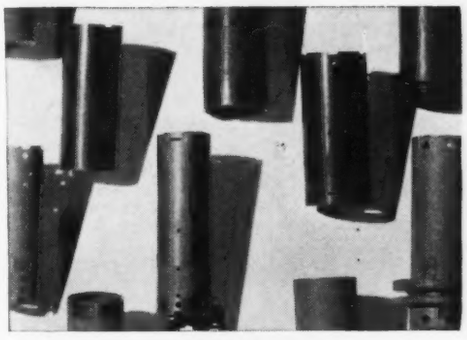
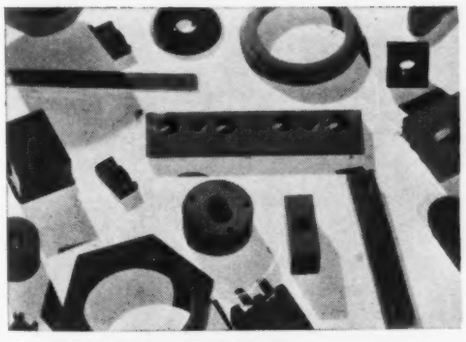


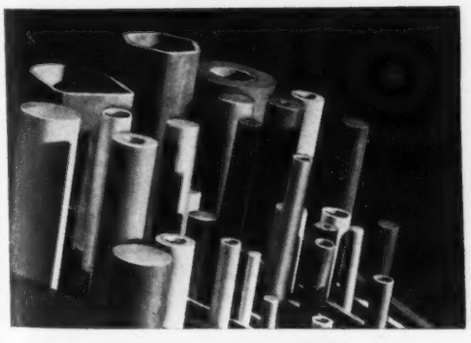
HIGH VOLTAGE INSULATORS



COIL FORMS



INSULATING PARTS



SHEETS — RODS — TUBES

The principal virtue of a good designer is his curiosity. If worth his salt, he is constantly on the look-out for ways and means to step up performance, improve the appearance or lower the production cost of his company's products. *Discoveries* along these lines mean something! And when designers are thinking in terms of new materials it is perfectly natural that they should consider DILECTO. For here is a material of almost unlimited possibilities. . . . This laminated plastic possesses high mechanical and dielectric strength, is half the weight of aluminum and machines like brass. It is chemically inert, insoluble and infusible. Add to these qualities a beautiful appearance and you have some idea of how DILECTO will fit into your plans for product development. . . . Your request for further information will receive a prompt and intelligent answer.

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"Bridge-Meg" Resistance Tester. A combined "Megger" Tester and Wheatstone Bridge—the Electrician's complete resistance measuring outfit.

IN the Plant Engineer's own words:

"We bought our 'Megger' primarily to aid us in salvaging electrical equipment after the 1937 flood, and it enabled us to save nearly 100 pieces of apparatus with but one or two final failures, and thus we feel it has paid for itself many times over. The 'Megger' instrument is now used for checking periodically all of our electrical equipment and is contributing to lower maintenance costs."

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"Dionic" Water Tester
"Frahm" Vibrating-Reed Tachometers and Frequency Meters
"Jagabi" Rheostats
"Jagabi" Speed-Measuring Instruments

Sales Opportunities

WASHINGTON, D. C.—Potomac Electric Power Company is considering further expansion in main generating station, where a 35,000-kw. turbo-generator unit recently was installed, to include installation of another similar generator, capacity to be determined, and complete auxiliary equipment. Proposed to carry out work as a 1939 project.

CHATTANOOGA, TENN.—Chattanooga Electric Power Board, S. R. Finley, general manager, will take bids at once, closing about December 1, for construction of new transmission line from Chickamauga Dam hydro-electric power plant of TVA to city limits, making third such line for power supply from TVA system (Contract No. 1-A).

MOUNT PLEASANT, IOWA—Receives bids until November 30 for extensions and improvements in municipal electric power plant, including installation of new 1,500-kw. steam turbo-generator unit, with alternate bids on 1,250-kw. turbo-generator, surface condenser, feedwater heater, pumps, switchgear and miscellaneous equipment. Young & Stanley, Inc., Muscatine, Iowa, is consulting engineer.

PORTLAND, ORE.—J. D. Ross, administrator for Bonneville, Ore., project, Department of Interior, Portland, receives bids until November 29 for 115-kv. and 230-kv., 600-amp., three-pole, single-throw, floor-mounted circuit breakers, outdoor type (Circular 75).

IDAHO FALLS, IDAHO—Has plans under way for expansion and improvements in municipal electric power plant, including installation of additional equipment. Cost about $307,500, of which $138,391 will represent a federal grant. C. R. Black is city engineer.

GALVESTON, TEX.—Todd Galveston Dry Docks, Inc., plans installation of motors and controls, regulators, conveyors, electric cranes, electric hoists and other equipment in connection with extensions at local drydock and ship repair plant, including new drydock unit to handle vessels from 8,000 to 10,000 tons rating, shops and other buildings. Cost over $500,000. Work is scheduled to begin at once.

COLUMBUS, OHIO—Columbus & Southern Electric Company, 215 North Front Street, has filed plans for new one-story indoor power substation at North High and Acadia Streets, and will proceed with work at once.

MOORHEAD, MINN.—Has plans maturing for extensions and improvements in municipal electric power plant, including installation of additional equipment. Cost about $196,000, of which about $108,000 will represent a bond issue, to be voted soon, and remainder a federal grant. Helmick, Eduskuty & Lutz, Essex Building, Minneapolis, Minn., are consulting engineers.

GEORGETOWN, S. C.—American Cyanamid & Chemical, 30 Rockefeller Plaza, New York, N. Y., plans installation of transformers and other power substation equipment, motors and controls, regulators, conveyors, electric hoists and other equipment in new plant at Georgetown, where tract of about 72 acres of land fronting on Sampit River has been acquired. Present buildings on site will be modernized and improved, and other units erected. Plant will be used for production of sulphate of alumina and allied specialties. Cost over $500,000.

CRAWFORDSVILLE, IND.—Will take bids soon for 5,000-kw. turbo-generator unit and accessories, surface condenser, pumping machinery and auxiliary equipment for installation in municipal electric power plant, where expansion will be carried out. Commercial Testing & Engineering Company, 307 North Michigan Avenue, Chicago, Ill., is consulting engineer.

SAN ANTONIO, TEX.—San Antonio Public Service Company plans extensions and improvements in transmission and distributing lines in different parts of city and neighboring districts; also additions to power substations and new substation units, extensions in lines for rural service and increased service facilities in city area. Cost about $550,000. Work will form part of 1939 expansion and improvement program and will be carried out early in that year.

HIGH POINT, N. C.—City Council, E. M. Knox, city manager, is having revised plans prepared by Murray & Flood, Inc., 369 Lexington Avenue, New York, N. Y., consulting engineer, for proposed municipal hydro-electric generating plant on Yadkin River, near Winston-Salem, N. C., recently noted in these columns. Bids are scheduled to be asked at early date for construction. Municipality has arranged for additional financing through federal aid in amount of $6,492,600 for project, which will include power dam, generating station, transmission line to city limits, power substations and other operating facilities.

EASTLAND, TEX.—Has plans under way for municipal electrical distributing system, including transmission line for connection with power source, power substation and service facilities. Cost about $300,000. Financing is being arranged through federal aid. Joseph E. Ward, Harvey-Smider Building, Wichita Falls, Tex., is consulting engineer.

PLEASANT HILL, MO.—Has plans nearing completion for new municipal electric power plant and electrical distributing system. Cost about $154,000. Financing has been arranged through Federal aid. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are consulting engineers.

CHICAGO, ILL.—J. H. Stone & Sons, 1815 West 74th Street, plans installation of motors and controls, conveyors, electric crane and hoists, and other equipment in new one and multi-story corrugated paper box-manufacturing plant in Central Manufacturing District. Cost about $500,000. Work on superstructure will begin soon. A. Epstein, 2001 West Pershing Road, is architect and engineer.

SOUTH HILL, VA.—Has plans nearing completion for new municipal electrical distributing system and will proceed with work soon. Fund of $82,500 has been arranged by bond issue and further financing will be secured through federal aid. Wiley & Wilson, Peoples Bank Building, Lynchburg, Va., are consulting engineers.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, receives bids (no closing date stated) for three turbo-alternator units and auxiliary equipment for installation in power plant at Pearl Harbor, T. H. naval station (Specifications 9027).

EAST LIVERPOOL, OHIO—Has plans maturing for complete electrification of municipal waterworks station. Cost about $66,000, with equipment, of which $29,892 will be secured through a federal grant. Chester Engineers, Inc., Century Building, Pittsburgh, Pa., is consulting engineer.

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** AN INDUSTRIAL POWER USER ASKS— "Will you kindly advise whether soil heating cables described in * are available in shorter lengths."

** AN INDUSTRIAL POWER USER ASKS— "Where may we obtain complete technical information and figures on electrical precipitation of dust as mentioned in *"

** AN INDUSTRIAL POWER USER ASKS— "We note on page 7 of your Spring issue of * a device to replace old lamps. Where may we purchase such a device."

** AN INDUSTRIAL POWER USER ASKS— "We would like to know where to get additional information on the subject as outlined in attached * clipping.

** AN INDUSTRIAL POWER USER ASKS— "If possible please send us more information regarding the galvanizing process as mentioned in your * Vol. 2. Pg. 24."

** AN INDUSTRIAL POWER USER ASKS— "We will be pleased to have you send us information on the application of the electric eye for measuring turbidity in water as listed on page 18 of last issue of *"

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Municipal Plants

SEAFORD, DEL.—Town won a three-year fight when it recently acquired the electric light and power properties. The plant was purchased by the town council for $200,000. Townsmen voted for their own system in 1935, but a lengthy legal battle followed.

BOONVILLE, IND.—Ralph E. Roberts of Rockport, Ind., sitting as a special judge in the Warrick Circuit Court, ruled in favor of the city in the city's condemnation suit to purchase the local plant of the Southern Indiana Gas & Electric Company. Judge Roberts stated the court was satisfied as to the regularity of the proceedings and the right of the city to exercise the power of eminent domain for the use sought. The utility company asked for an appeal to the Indiana Supreme Court, which was granted and the appeal bond was placed at $1,000.

COLUMBUS, MISS.—After being advised by the PWA that its original offer was not a fair and reasonable price for the properties of the Mississippi Power Company, the city has increased its bid to $269,000. The new offer represents an increase of approximately $31,000 over the original proposal.

LIBERTY, MO.—Proposal to issue $195,000 in bonds to buy or build an electric light plant was defeated in a special election, 993 to 771. A PWA grant of $148,509 had been approved to cover 45 per cent of the project.

PALMYRA, MO.—The city has received a PWA grant of $30,000 to help finance the construction and equipping of a municipal light and power plant estimated to cost $66,836. Frank Beard, Kahoka, Mo., is consulting engineer.

STURGEON, MO.—Local voters at a recent election defeated a proposal that the city issue $15,000 in bonds to finance its share of a municipal electric system, or to purchase the existing privately owned system.

KENNETT, MO.—Several months are expected to elapse before the city may proceed with plans for constructing its proposed municipal light and power plant. Arkansas-Missouri Power Company, seeking to enjoin the city from constructing the plant, was granted 30 days in which to file a brief in federal court to substantiate its plea for the injunction. After that brief is filed the city will be given from ten to twenty days to file an answer and some time will then elapse before court action is taken. The controversy has been in the courts for more than two years.

NORTH BALTIMORE, OHIO—Village Council has decided to offer the Central Ohio Light & Power Company $27,090 for its electrical distributing system. C. J. Simon, engineer, who estimated the property at that value, reported officials of the company offered to present a new street lighting rate which would reduce the village's charges by $1,800 a year. A tentative government grant to the village to help finance the construction of a proposed municipal power plant provided that the village must offer to buy the local properties of the power company.

PELLY, TEX.—A temporary injunction has been issued by District Judge Allen B. Hanney restraining the city officials from issuing $175,000 of revenue bonds to aid in financing construction of a municipal light and power plant. City Council made an offer of $80,000 to the Houston Lighting & Power Company for the purchase of its electric light and power distribution system. Council also authorized the issuance of $100,000 of revenue bonds to finance a

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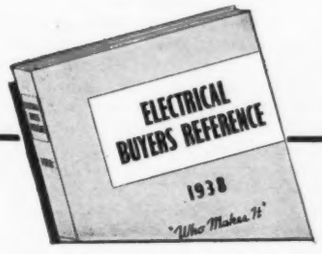

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municipal lighting and power system. Mayor W. C. Williams said the city was legally within its rights in voting to issue the $100,000 in revenue bonds without an election. Application was recently filed with the PWA for a loan and grant of $174,000 to finance the proposed municipal plant. Petitions were circulated protesting issuance of the revenue bonds with the purpose of obtaining enough signers to make mandatory submission of the proposal to a vote.

GONZALES, TEX.—A group of citizens has filed notice in the district court that they will contest the recent municipal election which resulted in voting favorably on the issuance of revenue bonds for the construction of a municipal electric power distributing system. The election, held September 30, resulted in a 28-vote margin of victory for the bonds. It is alleged that 41 votes were illegally cast. The case was set for hearing in the January term.

JASPER, TEX.—The $175,000 revenue bond issue to finance a city light plant carried by a 132 majority in a special election.

GALAX, VA.—Judge A. C. Buchanan has denied the Appalachian Electric Power Company an injunction restraining the town from promoting a bond issue of $158,000 with which to finance a municipal power plant. Voters on August 30 approved by a slim margin issuance of the bonds, to be matched by a PWA grant of $129,000. The night of the election the Appalachian company obtained a temporary injunction restraining the town from issuing the bonds. Subsequently, the validity of the election was questioned by a group of citizens, but the election was upheld in a ruling by Judge Walter H. Robertson, sitting at Abingdon. In his decision Judge Buchanan declared that "there may be grave doubt that the project proposed will result in benefit to the town; it may prove, as the plaintiff thinks, of great disadvantage. but if the town has the legal right to enter into the arrangement, that is as far as the court may inquire.

KEARNEY, NEB.—City Council has voted to apply for a PWA loan and grant to purchase or construct a municipal electric distribution system.

Recent Rate Changes

SCRANTON ELECTRIC COMPANY has agreed to file a temporary rate schedule at the suggestion of the state Public Utility Commission designed to save present customers approximately $560,000 a year. Of this amount approximately $521,200 will go to the company's electric customers and the remainder to its steam heat customers. The new rates are to be filed on or before December 1 and are to become effective on consumption during billing periods after December 1 for a trial period of six months. At the end of that period they may be extended for another six months at the discretion of the commission. In announcing the reduction, the commission stated: "This is one good utility that has in mind its obligations to the public. It has cooperated with the commission, although it is located in an area which has been hard hit by the depression."

BIRMINGHAM ELECTRIC COMPANY, by agreement with the Alabama Public Service Commission, has announced that the company's residential rate plan would be reduced, effective on and after December 5. It is estimated the saving would approximate $35,000 annually for the small domestic consumers. The new objective rate schedule is as follows: 3.9 cents for the first 50 kw.-hr., 2.5 cents for the next 250 kw-hr., 1.5 cents for all over 300 kw.-hr. Minimum monthly bill will be 70 cents.

CENTRAL HUDSON GAS & ELECTRIC CORPORATION, as a result of negotiations conducted by the New York Public Servile Commission, has filed a revision of its electric rates which is estimated to save consumers of the company more than $56,900 annually. The rate changes, which the commission permitted to become effective as of November 1, involve a revision of the general service rate, changes to comply with a commission order relating to metering of demands, other minor rate changes and the introduction of a bi-monthly meter reading plan in rural areas which does not apply to demand charges. Of the $57,000 in reductions, consumers will save more than $46,700 by revisions of the general rate for commercial and industrial service. Savings of more than $9,600 will result from changes made in the power rate and changes in the heating rate will save consumers nearly $600 annually.

MOUNTAIN STATES POWER COMPANY has established new tariffs for commercial power users of the Willamette Valley division. Under the new lighting rate, which drops the top step from 6 cents a kilowatt-hour to 5 cents a kilowatt-hour, 3,400 commercial customers will save about $40,000 a year. New street lighting rates will cut existing revenues from this source $6,300 annually.

SOLAR ELECTRIC COMPANY has been directed to file a new rate schedule providing an annual reduction in rates of not less than $14,745. Exceptions to the order has been filed by the company. The Public Utility Commission order requires the company to file within fifteen days a new tariff effective upon ten days' notice, embodying rates designed to yield annual revenues not to exceed $72,535; disallows certain payments made by Solar to its Associated Gas & Electric affiliates; disallows under operating expenses any money paid by the company for the investigation, and suggests the procedure complainants should follow in the matter of reparations.

SOUTH CAROLINA ELECTRIC & GAS COMPANY has moved to prevent a reduction in its electric rates ordered by the state Public Service Commission. In a formal petition for a hearing the company denied it was receiving an excessive return on the value of its property and maintained that the putting into effect of the proposed rates would amount to confiscation of its property. Commissioner John C. Coney said a date for the hearing would be announced later. Meanwhile, the order for a reduction in rates for electric power will be held in abeyance until the matter is settled.

NEW LONDON POWER COMPANY, New London, Ohio, has announced a reduction in its general power rate, effective on all bills issued on and after December 1. The new power rate is: first 40 kw.-hr. at 5 cents a kilowatt-hour, the next 460 at 4 cents per kilowatt-hour, the next 500 at 3 cents per kilowatt-hour, the next 2,000 at 2½ cents a kilowatt-hour, the next 7,000 at 2 cents a kilowatt-hour and all additional at 1½ cents. This rate is a reduction to all power consumers who use more than the minimum. The company reports this new power rate is an average reduction of approximately 10 per cent, while to some consumers it will be as much as 27 per cent.

Ground Line Treatment of Standing Poles

[*Continued from page 37*]

veloped by the Line & Cable Accessories Company.

3. Protective concrete sleeve with pea gravel and creosote developed by the Toronto Hydro-Electric System.

4. "Cobra" process.

Methods 1 to 3, inclusive, are very similar in technique and the supply of creosote can be replenished every three to five years at a cost of about 50 to 75 cents a pole.

The Cobra process originated in Germany and is a method of injecting toxic salts, such as those used in the "Osmose" process, into a pole by means of a needle. It is understood that the "Osmose" process was developed from this process and is much easier to apply and is more effective than the Cobra process.

Some specific comments by utilities

COMPANY A—Experience has shown that preserving standing poles at the ground line pays. Have had insufficient experience to determine the most efficient method. The choice seems to lie between charring and spraying and Osmose.

COMPANY B—In general not very remunerative for us to treat standing poles. Poles in need of such treatment can have life prolonged only about five years at best and possibly only two or three years.

COMPANY C—Tests of supplementary treatment now in progress do not show conclusively that life is prolonged sufficiently to justify widespread application of the treatment.

COMPANY D—No regular program for treatment of standing poles. A number have been treated experimentally with various treatments, particularly Osmose. Experience too short to afford authentic data on life, costs, etc.

COMPANY E—Experience with Osmose covers two-year period. This is not long enough to draw definite conclusions regarding its merits.

•

Gets Bonneville Contract

United States Engineer Office, Bonneville, Ore., has awarded the contract to the S. Morgan Smith Company, York, Pa., at $1,654,557 for furnishing and delivering two 74,000-hp. hydraulic turbines, with governing equipment and complete accessories, including control gates, stems, levers, etc., for installation in the Bonneville hydro-electric generating station.

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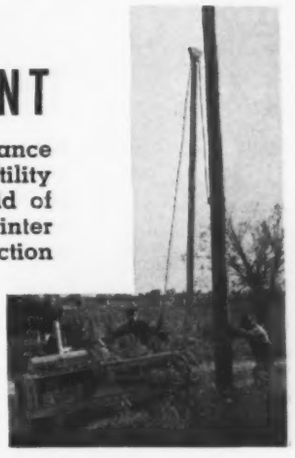

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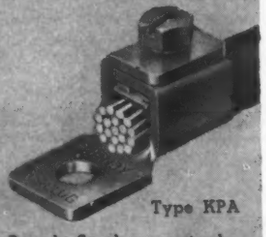

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Glass Fiber Enters Electrical Insulation Field

[*Continued from page 42*]

hold the loads of the future for the electrical industry that glass makes an encouraging contribution; in fact, it is those uses which are sustaining the glass fiber industry. Ultimately, as housewall insulation, it may be the means of making electric heating economically feasible in the temperate belt. But right now it is the insulation used in half the refrigerators being sold into American homes. As a filter for air conditioning systems it has the requisite non-combustibility, washability and permanence. For the cleaning of hot gases it averts the losses from infiltration and dilution that are experienced when cotton or wool filters are used with their 212–230 deg. F. temperature limits. Fan volumes drop and furnace operations are more finely controlled when glass does the filtering without introducing large volumes of air just to reduce the temperature to a value safe for the filter.

Prospects for the product

Recognizing that glass fiber has been developed to the point where it has been commercially adopted or considered for a widely diversified list of electrical equipment and supplies and prognosticating further on the enumerated properties and the recounted potentialities it seems reasonable to look for glass fiber to:

1. Render the fine-tape, high-temperature requirements of the electrical industry.

2. Serve as appropriate insulation of magnet wires subjected to the higher temperature applications.

How rapidly it fulfills these expectations depends on the successful completion of trial applications of electrical insulation being conducted. Meanwhile there has been a considerable amount of commercial adoption. Sooner or later the resistance of glass fiber to heat and chemical deterioration will probably accord it an opportunity to serve in large machines in which economic factors make long life dependent upon enduring freedom from insulation deterioration. Another field is that of apparatus subjected to extremes of service conditions. For the general run of equipment its potentiality is in enhancement of ratings or lowered cost of over-all designs.

Strobo-Meter for Efficient Meter Testing

[*Continued from page 59*]

meter. The result of these changes was the elimination of the function of the prism arm, thus simplifying the testing operation.

Another change was the addition of what amounts to a push type switch, the elongated button portion of which extends upward and is operated by the weight of the meter. This was mounted on the block by which connection to the meter under test is made. It is simply pushed downward by the terminal block when the meter is set in place. By means of this switch energy is cut on and off to the high-intensity lamp of the strobo-meter. By this device the lamp burns only when a meter is in position for check on the board. Also, a small red lamp has been mounted on the board and so connected as to light if there is a ground in the meter being tested.

Creep detected

An interesting feature of the strobo-meter is the ease with which a creeping meter may be detected. The paint of the black mark on the edge of the disk fills up the valleys between the small projections of the milling. This shows up, magnified as a solid black area on the ground glass when testing current is cut off and the disk is positioned with the black mark in the light beam. Any movement of the disk is much more readily apparent from watching the image on the viewing screen than by observing the mark on the disk.

In order to gain full advantage of the increased testing capacity of this device, arrangements have been made to have the meters accessible to the operator, where they may be reached from a sitting position. Facilities for making meters more accessible for testing have been provided by the use of a rotatable meter rack (which appears in one of the accompanying illustrations) and of flat skid trucks.

The rack is cylindrical in shape, is made from a straight-sided barrel reinforced and is rotatably mounted on a platform. It may be picked up and moved by a four-wheel lift truck. The barrel turns on casters on a circular track of flat iron on the platform and is centered on the track by a guide through the bottom head. Around the barrel are four rows of screws, ten in each row, on which the meters are hung. The rack holds 40 meters and is placed in a position accessible to the operator. The flat skid trucks are merely movable platforms. One of the platforms, which holds approximately 100 meters, may be placed at one side of the strobometer within reach of the operator, and as the meters are tested they are transferred to another platform placed at the other side. These platforms may be picked up and moved by means of a four-wheel lift truck.

•

Power Production in Texas

Electric power in Texas during September differed only slightly from the preceding month and the like month last year, according to the Bureau of Business Research of the University of Texas. Aggregate production during the entire third quarter also differed only slightly from that of the corresponding period last year. Reports from sixteen representative Texas companies show a decline in production of 1.3 per cent from a year ago, but an increase of 0.5 per cent over August this year. For the entire third quarter there was a decline of 0.7 per cent in comparison with the third quarter last year.

•

Board Orders Rate Refund

After hearings lasting more than five years, the New York Public Service Commission has announced that the Queens Borough Gas & Electric Company had been ordered to refund about $500,000 to its consumers of electricity on the Rockaway peninsula and in several Nassau County towns. The order, filed by the commission in 1933, was fought for five years. The original order called for only a temporary rate reduction of 15 per cent for a one-year period. The company is to start making the refunds not later than December 1 and it is expected that the task will be completed by February 1 next.

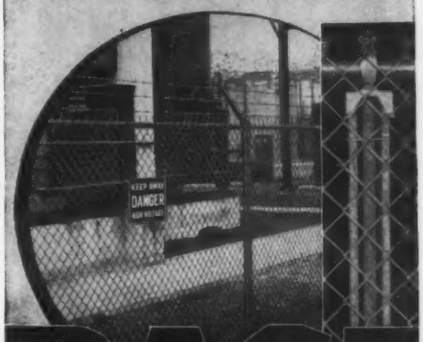
•

New Lighting in Kingston

A new lighting system has been installed in Kingston, N. Y., along the city's main traffic and business artery. Engineers of the General Electric Company designed the new system. More than 270 luminaires, with 1,500- and 1,000-cp. incandescent lamps, are mounted on ornamental metal standards 135 ft. apart on both sides of the thoroughfare. Central Hudson Gas & Electric Corporation made the installation and maintains the new lights.

LOOK

TO PAGE FOR THIS SPECIALLY DESIGNED P-12 WING-CHANNEL POST



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Announces New Loans for Rural Projects

Among the allotments recently announced by the Rural Electrification Administration are the following:

ALABAMA—Pea River Electric Membership Corporation, Sam K. Adams, president, Clayton, $374,000 to build 407 miles of line, 1,367 customers in Barbour, Dale and Henry Counties. Southern Pine Electric Membership Corporation, B. L. Martin, president, Brewton, Ala., $236,000 to build 282 miles of line, 578 customers in Monroe, Conecuh and Escambia counties. Alabama Power Company, $359,000, of which $220,500 will be used to connect 2,100 new customers along existing rural lines, and $138,500 to build approximately 130 miles of line in 15 counties to serve 558 customers.

DELAWARE—Delaware Rural Electric Association, Roland J. Marsh, superintendent, Greenwood, $309,000 to build about 302 miles of line, 823 customers in Kent and Sussex counties.

IOWA—D.E.K. Rural Electric Co-operative, Gaylord Olson, president, Estherville, $431,000 to build 417 miles of line, 991 customers in Dickinson, Emmet, Kossuth, Clay, Palo Alto and Winnibago counties.

MINNESOTA—South Central Electric Association, Edward C. Meier, superintendent, St. James, $225,000 to build 206 miles of line, 516 customers in Cottonwood and Redwood counties.

MISSISSIPPI—Central Electric Power Association, E. T. Thames, superintendent, Carthage, $245,000 to build 256 miles of line, 870 customers in Newton, Attala, Leake, Scott, Rankin and Neshoba counties.

OHIO—South Central Rural Electric Co-operative, Inc., Darwin Kindler, manager, Lancaster, $332,000 to build 318 miles of line, 1,198 customers in Fairfield, Franklin, Hocking, Madison, Muskingum, Perry, Pickaway and Ross counties.

PENNSYLVANIA—Tri-County Rural Electric Co-operative Association, Maurice S. Whitlock, superintendent, Mansfield, $240,000 to build 183 miles of line. 555 customers in Potter and Tioga counties. Central Rural Electric Co-operative Association, James B. Byers, superintendent, Clearfield, $226,000 to build 184 miles of line, 809 customers in Cambria, Clearfield, Indiana and Jefferson counties.

TEXAS—Hamilton County Electric Co-operative Association. Van Wisdom, president, Hamilton, $286,000 to build 350 miles of line, 867 customers in Coryell, Mills, Hamilton, Comanche and Lampasas counties.

GEORGIA—Sumter Electric Membership Corporation, Douglas L. Thomas, superintendent, Americus, $282,000 to build 314 miles of line, 1,237 customers in Terrell, Randolph, Webster, Stewart, Sumter, Schley and Quitman counties.

ILLINOIS—Corn Belt Electric Co-operative, Inc., Walter Bisser, president, Bloomington, $1,164,000 to build 1,146 miles of line, 3,481 customers in McLean, Tazewell, DeWitt, Logan, Woodford, Ford and Champaign counties.

MISSOURI—Inter-County Electric Co-operative Association. William R. Fisher, superintendent, Licking, $236,000 to build 198 miles of line, 862 customers in Phelps, Dent and Texas counties.

NEBRASKA—Boone-Nance Rural Public Power District, P. P. Cedar, president, St. Edward, $226,000 to build 191 miles of line, 447 customers in Boone, Nance and Platte counties. Hamilton County Rural Public Power District, Thomas A. Williamson, president, Aurora, $216,000 to build 199 miles of line, 486 customers in Hamilton, Howard and York counties.

WYOMING—Big Horn Rural Electric Company, M. M. Rousch, superintendent, Basin, $207,000 to build 182 mile of line, 502 customers in Big Horn and Washakie counties.

Construction contracts approved follow:

Buena Vista County Rural Electric Co-operative, Storm Lake, Iowa, Miles Nelson, superintendent, contract to Snyder and Johnson, Humboldt, for building the second section of the project, consisting of 378 miles of line, 707 customers; bid $246,908.

Fruit Belt Electric Co-operative, Cassopolis, Michigan, Robert Thompson, superintendent, contract to the Laird Construction Company, Battle Creek, for building another section of project, consisting of 565 miles of line, 1,883 customers; bid $454,000.

Van Buren Electric Co-operative, Paw Paw, Mich., C. E. Dow, superintendent, contract to Harris-McBurney Company, Jackson, for building second section of project, consisting of 239 miles of line, 1,195 customers; bid $212,450.

Cloverland Electric Co-operative, Sault Sainte Marie, Mich., H. C. Peasley, superintendent, contract to E. B. Schwaderer, Cass City, for building first section of project, consisting of 366 miles of line, 1,085 customers; bid $278,000.

Lake Region Co-operative Electrical Association, Fergus Falls, Minn., J. A. Tully, superintendent, contract to the E. W. Wylie Company, Inc., St. Paul, for building second section of project, consisting of 290 miles of line, 700 customers; bid $209,712.

Guernsey-Muskingum Electric Co-operative, Inc., New Concord, Ohio, H. B. Smith, superintendent, contract to Day and Zimmermann, Philadelphia, for building first section of project, consisting of 220 miles of line, 1,036 customers; bid $225,278.

Northwestern Rural Electric Co-operative Association, Saegertown, Pa., Bruce V. Hecker, superintendent, contract to the Monroe Electric Company, Chicago, for building another section of project, consisting of 334 miles of line, 1,300 customers; bid $279,485.

•

Offers New Welding Course

A new curriculum in Ohio State University's college of engineering leading to a degree in welding engineering has been announced for the autumn quarter, which started on October 4. Investigations by a committee of department chairmen, in consultation with industrial representatives, revealed a "healthy demand" for men with the specific training to be offered in the new welding curriculum. Administration of the curriculum will be under the department of industrial engineering.

•

Cheyenne Line Contract

The Bureau of Reclamation, Denver, Colo., has awarded a contract to Fritz Ziebarth, Long Beach, Calif., for construction of new transmission line from Cheyenne, Wyo., to Gering, Neb., Kendrick project, at $31,823.

BOOK REVIEWS

Gaseous Electrical Conductors

By E. L. E. Wheatcroft. Published by Oxford University Press, 114 Fifth Ave., New York. 262 pages, illustrated. Price, $6.50

For the power engineer the title is insufficient to indicate the non-abstract character of some of the treatment. These lectures at Leeds University start with the mechanics and electronics of gases and end with an exposition of circuit breakers, rectifiers, thyratrons and luminous discharge tubes. Between these extremes the author bridges the gap otherwise left by disjointed research and design literature. The treatment thus elaborates Slepian's emphasis upon the fortunate ability of a conducting gaseous medium to change in a matter of micro-seconds into a high resistance path which interrupts the current in a breaker or a rectifier. Along the path of this evolution there is a correlative development of thermionic emission, the inconclusive theories of breakdown, the glow, the arc, the time lag, vacuum valves. The treatment is both mathematical, expository and descriptive.

•

Alternating-Current Circuits

By Russell M. Merchner and George F. Corcoran. Published by John Wiley & Company, 440 Fourth Avenue, New York. 510 pages, illustrated. Price, $4.75.

As a college text for junior class electrical engineers this book shows a marked degree of accommodation to the circuit problems of current engineering practice, of both the power and the communication stamp. After dealing in abstract manner with RLC circuit phenomena, wave analysis and coupling, there is attention given to the transformer (air and iron cored) and to circuit measurements. The polyphase system, its harmonic propensities, the wye-delta equivalences and the methods of balanced power measurement come next, with moderate recognition of the unbalance phenomena. About equal prominence is given to the power transmission line and to the filter circuits of the communication engineer. The final chapters on symmetrical components and transient conditions show appreciation in simple manner of the growing importance of fault currents and abnormal conditions in elementary engineering education.

•

Trockengleichrichter

(Junction Rectifiers)

By K. Maier. Published by R. Oldenbourg, Munich. 313 pages, 313 illustrations. Price, 18 reichsmarks.

This is a timely book on a type of device that is of increasing interest in electrical practice. Although the unilateral conductivity of copper sulphide has been known for more than 60 years, the practical development of rectifiers using dry films has occurred chiefly during the past decade. These rectifiers are useful particularly for relatively small output in the range up to 80 volts and a few amperes. Only three kinds are of present practical interest—the copper oxide, copper sulphide and selenium sulphide types. Forms of

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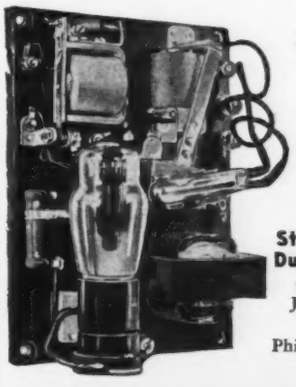

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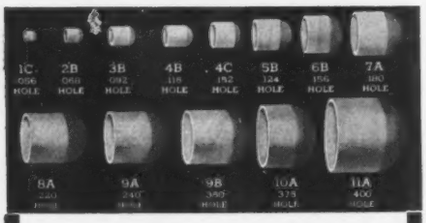

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construction are described and performance is discussed for various connections and kinds of load, with characteristic curves. One of the final sections of the book is devoted to a résumé of researches in the theory of semi-conductors and rectifying films, which, as the author states, is not yet completely understood.

•

Handbook of Residential Lighting Practice

By Myrtle Fahsbender. Published by Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Company, 150 Broadway, New York. 194 lithographed pages, illustrated. Price, $1.

Intended for use as a manual by those utility employees whose chief concern is home lighting work—home lighting advisers—as well as a text, this handbook treats of artificial light and its application in the home. Beginning with a discussion of light and vision, definitions of electrical and illumination terms and types of light sources, the author continues with a description of the types and proper uses of residential lighting equipment. The possibilities offered by colored light in the home are considered, as well as the newer subject of garden lighting. So that the home adviser will not be entirely unfamiliar with home wiring, this phase is taken up in one chapter. Perhaps the most useful single chapter in the book is the one which discusses the general lighting requirements of the separate rooms in the home.

•

Trade Associations in Law and Business

By Benjamin S. Kirsh and Harold Roland Shapiro. Published by Central Book Company, 245 Broadway, New York, N. Y. 399 pages. Price, $5.

Initiation of the so-called monopoly investigation makes this book timely because it explores the voluntary associations which appear sure to be embraced in that investigation. The court rulings which have built up the legal upper and lower limits to the functional services of trade association are the basis of the treatment. These functions include statistical reporting service, uniform cost accounting, trade relations, standardization, credit bureaus, boycotts and defensive combinations, patent licensing, collective purchasing and foreign trade activities. In each category it is shown how the common good has been construed by the courts to demand the evolution of trade association practices toward the present pattern in which the institution serves the middle ground between unrestrained monopoly on the one hand and the oppression of the government regulator and "trust-buster" on the other.

•

Air Conditioning for Comfort

By Samuel R. Lewis. Published by Keeney Publishing Company, Inc., 6 North Michigan Avenue, Chicago, Ill. 285 pages, illustrated. Price, $2.50.

Extensive revision, enlargement and redrafting is noted in this third edition of the book by a practising air-conditioning engineer, a former A.S.H.V.E. president. In particular, in its numerical treatment of problems it replaces many rule-of-thumb and slide-rule approximations by more exact computations. While organized as a textbook rather than a reference handbook, the new edition more than ever gives physi-

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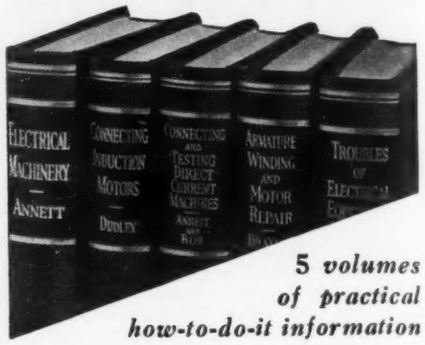

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L'Electricité dans les Exploitations Agricoles

(*Electricity in Agriculture*)
By R. Borlase Matthews and R. H. Drilhon. Published by J.-B. Baillière et Fils, Paris VI. 700 pages, 581 illustrations. Price, 150 francs.

Heretofore efforts have generally been made to apply electricity to existing agriculture, the author states. In the future, agriculture should be modified to avail itself of the possibilities of electricity. And so the envisioned farmer, released from drudgery and drab surroundings, becomes a craftsman charmingly housed in "rural villages," with administrative centers and cultural facilities and outlying large modern dairies, garages for tractors, repair shops and other accessories to a mechanized agriculture and a higher standard of living.

Electrification is broadly considered with reference to the home, as well as to the multifarious possible uses in agriculture. Encyclopedic in content, this substantial treatise should be of value to power salesmen engaged in rural load building, to agricultural engineers, and farmers.

See Curb on New Reforms

[*Continued from page* 64]

against the handicap of popular prejudice against a third term.

It will soon become manifest to all of them who have not been bitten themselves by the presidential bug—which bite leaves a man perfectly normal, or at least as normal as he was before on every other question, but deprives him of any logic whatever as to his own presidential chances—that Roosevelt is the only New Dealer who has a chance for the next Democratic nomination. Nothing that Roosevelt can conceivably do would bring about the nomination of one of the Brain Trust group. Purge primaries settled that.

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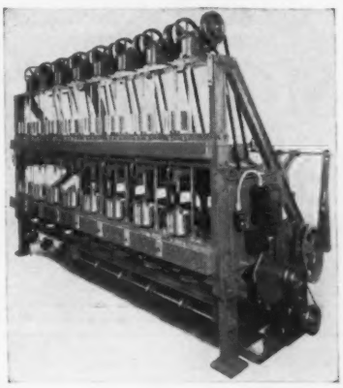

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P.W.A. PROJECT DOCKET
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ELECTRIC DISTRIBUTION SYSTEM
SUB-PROJECT—CONTRACT NO. 1-A
ELECTRIC POWER BOARD
OF CHATTANOOGA
CHATTANOOGA, TENNESSEE

Sealed proposals for the construction of Sub-Project—Contract No. 1-A of the Electric Power Board of Chattanooga, acting for and on behalf of the City of Chattanooga, Tennessee,

P.W.A. Project Docket
No. Tenn. 1105-P-DS
Electric Distribution System
SUB-PROJECT—CONTRACT NO. 1-A

will be received by the Electric Power Board of Chattanooga, Chattanooga, Tennessee, at the office of the Secretary of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee, until 1:30 P. M. on the 23rd day of November, 1938, and will be immediately publicly opened and read by the Electric Power Board of Chattanooga.

Copies of the Proposal, Contract Documents, Plans and Specifications may be obtained from the office of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee. A deposit (certified check) of One Hundred ($100.00) dollars will be required for procuring the Proposal, Contract Documents, Plans and Specifications. The deposit for these documents will be returned to all except the successful bidder upon the return of the documents in good condition within ten (10) days after the bids are opened.

A copy of the Proposal, Contract Documents, Plans and Specifications may be examined free of charge at the Chamber of Commerce and the office of the Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Each bid must be accompanied by a Certified Check, or Bidder's Bond executed by the bidder and a surety company licensed to do business in Tennessee, in the sum of ten (10%) per cent of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a Performance Bond in the amount of one hundred (100%) per cent of the contract price. This Performance Bond shall be made through a Company having a duly authorized representative in Chattanooga, Tennessee, upon whom process may be served.

All items in the proposal form must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

All bidders must be licensed contractors as required by Chapter 70 of the Public Acts of 1931 of the General Assembly of the State of Tennessee, Section 1. Bidder's name and license number must be placed on the envelope containing these documents, and also upon this envelope shall be designated the name and contract number which the bid covers.

WAGES: Attention is called to the fact that no less than the minimum wage rates as set up in the Specifications shall be paid on this project.

WITHDRAWAL OF BIDS: Bidders may withdraw bids at any time prior to the opening, but thereafter no bidder may withdraw a bid submitted for a period of sixty days after the date set for the opening of such bids.

The estimated cost of the construction of the project covered by this contract is $80,000.00.

The Electric Power Board of Chattanooga, Chattanooga, Tennessee, reserves the right to reject any and all bids, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

ELECTRIC POWER BOARD OF CHATTANOOGA
Chattanooga, Tennessee
By L. J. Wilhoite, Chairman
G. H. Patten
J. C. Twinam
Stanton E. Smith
Will F. Chamlee, Counsel.
ATTEST:
N. J. Simmons, Secretary

OFFICIAL PROPOSALS

Bids: November 29 (49)

Substation Transformer

P.W.A. PROJECT DOCKET
No. TENN. 1105-P-DS
ELECTRIC DISTRIBUTION SYSTEM
SUB-PROJECT—CONTRACT No. 3-F
ELECTRIC POWER BOARD
OF CHATTANOOGA
CHATTANOOGA, TENESSEE

Sealed proposals for the manufacture and delivery of Sub-Project—Contract No. 3-F of the Electric Power Board of Chattanooga, acting for and on behalf of the City of Chattanooga, Chattanooga, Tennessee,

PW.A. Project No. Tenn. 1105-P-DS
Electric Distribution System
SUB-PROJECT—CONTRACT No. 3-F

will be received by the Electric Power Board of Chattanooga, Chattanooga, Tennessee, at the office of the Secretary of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee, until 1:30 P. M. on the twenty-ninth day of November, and will be immediately publicly opened and read by the Electric Power Board of Chattanooga.

Copies of the Proposal, Contract Documents and Specifications may be obtained from the office of the Electric Power Board of Chattanooga, Municipal Building, Chattanooga, Tennessee. A deposit (certified check) of twenty-five ($25) dollars will be required for procuring the Prosal, Contract Documents and Specifications. The deposit for these documents will be returned to all except the successful bidder upon the return of the documents in good condition within ten (10) days after the bids are opened.

A copy of the Proposal, Contract Documents and Specifications may be examined free of charge at the Chamber of Commerce and the office of the Electric Power Board of Chattanooga, Chattanooga, Tennessee.

Each bid must be accompanied by a Certified Check, or Bidder's Bond executed by the bidder and a surety licensed to do business in Tennessee, in the sum of ten (10%) per cent of the amount of the bid. The bond is required as a guarantee that if the bid is accepted, a contract will be immediately entered into and the performance of it properly secured. The successful bidder will be required to execute a Performance Bond in the amount of one hundred (100%) per cent of the contract price. This Performance Bond shall be made through a Company having a duly authorized representative in Chattanooga, Tennessee, upon whom process may be served.

All items in the proposal form and on data sheets must be properly filled out and must not be detached from the specifications. No qualifying letters or statements will be considered.

Bidder's name must be placed on the envelope containing this document and also upon this envelope shall be designated the name and contract number which the bid covers.

WITHDRAWAL OF BIDS: Bidders may withdraw bids at any time prior to the opening, but thereafter no bidder may withdraw a bid submitted for a period of sixty days after the date set for the opening of such bids.

The estimated cost of the equipment of the Project covered by this contract is $90,000.

The Electric Power Board of Chattanooga, Chattanooga, Tennessee, reserves the right to reject any and all bids, and to waive informalities therein.

Any bid received after the scheduled closing time for receipt of bids will be returned to the bidder unopened.

ELECTRIC POWER BOARD
OF CHATTANOOGA
CHATTANOOGA, TENNESSE
By L. J. Wilhoite, Chairman
J. C. Twinam
G. H. Patten
Stanton E. Smith
Will F. Chamlee, Counsel.
ATTEST:
N. J. SIMMONS, Secretary.

Bids: November 22 (48)

Change of Bid Date

NOTICE: A change of date for the opening of bids for the Generator Contract for the Santee-Cooper Project has been made by the South Carolina Public Authority, naming the date November 22, 1938.

(Continued on the following page)

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Copy for New Advertisements Received Until Monday 10 A. M. for the Following Saturday's Issue (*published every other week*)

OFFICIAL PROPOSALS

Bids: November 22 (47)

Change of Bid Date

NOTICE: A change of date for the opening bids for Turbine and Governor Contract for the Santee-Cooper Project has been made by the South Carolina Public Service Authority, naming the date November 22, 1938.

POSITIONS VACANT

(See also "Selling Opportunities Offered")

A POSITION is open for an estimating electrical engineer—one who is familiar with Chicago and vicinity estimating problems. Give full information as to qualifications, past experience, references, etc., in your first letter. Substantial salary will be paid to the individual who can fill this position. If you do not qualify, please do not reply. All information will be strictly confidential. P-564, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

RESIDENT ENGINEER and Staking Leaders wanted immediately for R.E.A. Construction. Give age, education, experience, and references in first letter. P-561, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS, $2,500 to $25,000. This thoroughly organized advertising service of 28 years' recognized standing and reputation carries on preliminary negotiations for positions of the caliber indicated through a procedure individualized to each client's personal requirements. Several weeks are required to negotiate and each individual must finance the moderate cost of his own campaign. Retaining fee protected by a refund provision as stipulated in our agreement. Identity is covered and, if employed, present position protected. If you have actually earned over $2,500, send only name and address for details. R. W. Bixby, Inc., 262 Delward Bldg., Buffalo, N. Y. (Elec. World).

EXECUTIVES AND TECHNICAL MEN. Contact employers for positions through our confidential and effective methods. The negotiate preliminary overtures. Established 24 years. Inquiries invited. H. H. Harrison, Director, The National Business Bourse, 20 West Jackson Blvd., Chicago.

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ELECTRICAL ENGINEER, 25, completed comprehensive student course with large electrical manufacturer seeks position in consulting or industrial engineering; construction experience. PW-562, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

COMMON SENSE FOR SALE. Would like position as assistant to executive with problems in finance and outside relations. Am 34 years old with pleasant personality. Good background in investment management, banking, personnel relations, sales promotion and security financing. Presently manager of Utility Department of leading investment advisory organization. PW-563, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRICAL ENGINEER. 15 years experience distribution systems, substations, manufacturing. Future planning, design, field surveys. PW-565, Electrical World, 330 W. 42nd St., New York, N. Y.

ELECTRICAL FOREMAN, (chief electrician) 20 years experience industrial electrical engineering; installation, maintenance, and repair both A.C. and D.C. equipment. Wiring and load surveys for more efficient operation. Technical education. Go anywhere. Chas. W. Ward, 233 Thorp, Kansas City, Kansas.

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WANTED

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